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MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE,

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

JANUARY, 1831.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN OCTOBER, 1830.

With Remarks and Exemplifications, by the Editor.

[Concluded from page 376 of vol. vi.]

44. For an improved *Smut Machine*, for hulling, smutting, and cleaning grain; Jeremiah Cose, Sodus, Wayne county, New York, October 1.

The grain to be cleaned by this machine is, in the first instance, made to fall from the shoe of the hopper into a riddle, and thence into a smut wheel, which is a wheel of fifteen inches in diameter, and three inches deep; this wheel has an eye of six inches diameter, made like that of a mill stone. The smut wheel is furnished on the under side with a sheet iron grater, or with points of iron, and runs upon a circular bed of sheet iron of the same diameter, and perforated with small holes. The grain passes between the scouring wheel and bed, and runs over eight small screens within the curb inclosing the wheel; thence it falls by a small opening through an air channel, into the eye of the stone. In its passage it is acted upon by an air wheel, or fan, to which the requisite motion is to be given, as well as to the smut, or scouring wheel.

There is no claim to any part of the machine.

45. For an improvement in the *Making of Pepper and Ink Tops;* William Markland, City of New York, October 1.

This patent is taken for raising the tops of ink stands, or pepper

boxes, out of one piece of metal, instead of by soldering, or grooving two pieces together. The raising is to be effected in any of the presses commonly used for such purposes, and we are informed that the tops may be ornamented, by means of beading rollers, which beading rollers consist of a male and female roller, between which the raised tops may be placed, and the bead, or other ornament raised upon them.

The claim is to "the making or manufacturing of *pepper* and *ink tops*, from one entire piece."

It is possible that the making of pepper and ink tops in this way, may not have been practised, but tops for canes, and many similar articles, have been so made. There is nothing new in giving to metal the form proposed, by the means pointed out in the specification, nor is it pretended that such is the case; the patent, therefore, must rest upon the exclusive application of the raised metal, to pepper and ink tops.

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46. For a *Thrashing Machine;* William Ottinger, Whitemarsh, Montgomery county, Pennsylvania, October 1.

We think it unnecessary to describe this machine, as it wears the uniform of the regiment to which it belongs, and if there is any difference in its accoutrements, these are not specified in its commission. The whole machine, with its cylinder, beaters, and hollow segment, is described, but no claim made.

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47. For an improvement in the *Construction of Hair Mattresses;* William F. Phyfe, City of New York, October 1.

These mattresses are to be stuffed with three or more distinct layers of hair, between which canvass extends from side to side, and is secured to the ticking which forms the borders of the mattress. The specification contains directions for stuffing the mattresses between the different cloths, and the manner of tying the strings which are to retain the stuffing in its proper place.

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48. For a *Rotary Steam Engine;* Thomas Powell, Baltimore, Maryland, October 1.

Instead of being for a rotary engine, as stated in the petition and specification, the patent is taken for dispensing with the crank in the ordinary reciprocating engine. The mode in which this is proposed to be done, is altogether without the recommendation of novelty. A rack upon the piston rod, is to work into cog wheels furnished with ratchets, in a way familiar to every one acquainted with the history of the abortive attempts which have been made to improve the steam engine.

The patentee informs us that "this engine *promises* to supersede all others, for simplicity of construction; for power obtained by a full action of the steam on the extreme periphery of the wheel; for power saved by reducing the friction, caused by the machinery ne-

cessary to keep up the action of the crank; for *gaining the loss of power* in the crank approaching to, and receding from, the dead points; and for doing away a large body of machinery, thereby simplifying the machine, and greatly reducing the expense."

We are of opinion that this promising machine will not falsify the old adage, that "quick promisers are slow performers." The same kind of machinery has made precisely the same promises to a large number of previous projectors, and has never yet redeemed its word. We, who know this, have no confidence in it on the present occasion.

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49. For a machine for *Drilling Rocks for Blasting;* John W. Post, Washington City, October 1.

This machine consists of the drill ordinarily used for the purpose of drilling rocks, but it is to be supported by a frame, standing upon four legs. It is to slide up and down through holes in the cross bars of this frame. The drill is attached to a double bow spring, at its upper part, and is to be loaded with a weight, should its own weight be too small. The drill is to be forced down by the hand in the usual way, and raised by the elasticity of the spring. The claim of the patentee is to "the use of the spring, constructed as above described, and the form of the rod, and its connexion with the spring; or whatever may prove to be original or novel, in the above description."

It is no uncommon error on the part of patentees, to suppose that after they have claimed certain specific things, they have a contingent remainder in certain others which may hereafter prove to be new: but who is to find out the novelty, if the inventor cannot? It is his business to inscribe *nole me tangere* on the part which he patents, and if he cannot tell where to place the label, he may rest assured that others have no interest in making the discovery.

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50. For a *Machine for Cutting Straw;* Titus Preston, Wallingford, New Haven county, Connecticut, October 1.

The description of this machine is of considerable length, entering into a minute description of all its parts, both new and old. Its general structure is similar to many long known straw cutters. The specification ends as follows.

"I do not, however, claim the whole machine herein described, as my invention. But I do claim as my invention and improvement, the feeding box, and its appendages, particularly the rack and screw wheel, as above described. The gate with its several appendages, and the mode herein described for fastening the plank upon the shaft; and the screws to regulate the knife. And for these, jointly and severally, I claim an exclusive right."

The cutter is a curved revolving knife, fastened to a plank by means of screws, with check screws to set it at the proper distance from the plank. The mode of doing this, it will be seen, is claimed; this mode, however, is well known to every machinist. The straw is drawn forward by an endless screw cut upon the back end of the

shaft upon which the revolving knife is fixed. This screw takes into a rack on the bottom of a feeding box; and the straw is thus regularly drawn forward by the revolution of the knife.

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51. For a machine for *Propelling Vessels through the Water;* Felix Peltier, City of New York, October 1.

The oft patented, and still oftener proposed screw, is here again brought forward for the purpose of propelling vessels through the water. The patentee says, "I make use for the propulsion of vessels, of a screw placed in a horizontal position, and wholly uncovered, or naked; that is to say, not working into a nut, or female screw, but enveloped wholly in water, which answers in respect to it, the same purpose as the female screw in the ordinary applications of that mechanic power, to the mechanics of solid bodies. And for the purpose to which I propose its application, I declare that every possible form or modification of the screw is adapted to the purpose, excepting the screw of Archimedes, in which the water passes through a hollow spiral channel. I therefore claim as forming a part of my invention, the right of using, for the propulsion of vessels, every form of the naked, or uncovered screw, whether it be formed of a single spiral wound round a solid arbor, and cutting it constantly at equal angles, or whether its inclination vary, and whether the spiral be of one and the same breadth throughout, or vary in its several dimensions measured from the arbor," &c. &c. &c. &c.

We have been so frequently called upon to pronounce upon the foregoing *new* invention, that to give an opinion upon its merits, would be merely to repeat what those who read our pages already know.

The present patentee is, we apprehend, secure in one point, and a very important one, namely, that of the many who have already tried his plan, not one will take him into court for evading their rights. To numbers of them the project has already proved as expensive and as profitless as is usually the case with a suit at law.

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52. For a *Machine for Raising Water;* Luman Parmelee, Poughkepsie, Dutchess county, New York, October 1.

The mode of raising water here patented, is very similar to that described at page 305 of the last volume; it also resembles several others patented both here and in England. It has no claim to novelty, and does not prefer any, for it places the whole machine before us, as though such an one had never been thought of before.

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53. For *Machinery for Manufacturing Cotton Twine,* and other small cordage, at one operation; Thomas Rice, Petersburg, Dinwiddie county, Virginia, October 1.

In this machinery, there are separate bobbins for twisting and for laying. For four strand twine there are four of the former, to three

of the latter, and so of any other number. The twisting bobbins are placed at one end of a frame, and the laying bobbins at the other. From the flyers of the twisting bobbins the yarn passes up through guides, to a roller, and after passing over this, it is conducted down to the laying bobbin beneath it. In passing over this roller down to the flyer of the laying bobbin, the strands are kept from riding, by passing separately through holes, or notches in brass plates. The claim is as follows.

"What I claim as my invention and improvement, is the application of the twisting spindles to this use; also the roller that draws the strands from the bobbins on the twisting spindles, regularly, as they are twisted. Also the two guides, one on the back of the roller, the other under the roller."

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54. For a mode of *Preventing Explosions in the Boilers of Steam Engines;* A. B. Quinby, Hagerstown, Washington county, Maryland, October 1.

(See specification.)

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55. For a machine for *Ornamenting Columns for Cabinet Makers,* carpenters, chair makers, turners in wood, metal, ivory and marble; Robert Thompson, Washington, Guernsey county, Ohio, October 1.

The machinery for which this patent is taken, bears a very near resemblance to several other machines, patented and unpatented, which have been used for a similar purpose. A frame is made to receive the post or column to be reeded or fluted, and a stock, like a plane stock, is carried backward and forward, being guided by the sides of the frame. Bits of different forms and kinds are fitted into the stock; a dividing plate regulates the arrangement of the flutes, reeds, &c. A mandrel furnished with spiral or other fillets, serves, by the motion of the stock, to turn the column round, as it receives the intended ornament.

"The invention here claimed is the before described mode of ornamenting all kinds of columns, in wood, &c. by means of a mandrel containing filleting, with the various adjusting stocks, and the machinery described for that purpose."

A claim so vague and general, affords no intimation whatever of the thing intended to be patented, unless the whole arrangement were new; but in cases like the present, where the novelty is questionable in nearly all the separate parts, the patentee ought to specify particularly in what his invention consists.

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56. For an improvement in the *Action of the Upright Piano Forte;* Jesse Thompson, City of New York, October 1.

The claim attached to the specification will give, to those acquainted with the subject, a general idea of the variations introduced in this action.

"What I claim as new, and as my own invention, is,"

"First, the application of the finger lever directly to the foot of the connecting rod, dispensing with the jack, springs, and all intermediate gearing. By this more immediate operation of the finger lever on the hammer, no time is lost between the touch and the blow; the action is more controllable by the finger; the blow is quicker and more powerful; the hammer can never block; it relieves less from the string; and requires much less depth of touch. The simplicity of its construction renders the work much cheaper, and less liable to get out of order than any known action."

"From this perfection of the action I have been able to render the span of the natural action to six and a half inches, and the others in proportion, without in any degree interfering with a clear and rapid execution. Or the common span of the octave may be retained."

"Second, the placing the dampers below the hammer rail, by which position the dampers fall on the brass strings nearer the middle of them, and thus more instantaneously and effectually stop their vibration, and may be raised by the simpler and cheaper modes herein before specified."

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57. For *Manufacturing Hat Bodies by Machinery;* Henry Tenny, Plattsburgh, Clinton county, New York, October 1.

This is another variation of the machines for forming hat bodies from a fleece taken directly from the carding machine. The wool is received, as in others, on a revolving apron, passed round rollers. The principal difference between it and some others, is, that the revolving apron passes over a roller which is large at each end, and small in the middle, just the reverse of the double conical formers upon which the wool is to be eventually rolled. The apron is made sufficiently loose to swag, so as to pass into the hollow of the concave roller. Behind this roller the double conical former is laid upon the apron, and as this moves round the hat former receives a wabbling motion, crossing the wool in the way required.

We are told that this is an improvement, but in what part of the arrangements the improvement consists, no information is given. Many parts of the machinery resemble others used for the same purpose; the portion which is new may probably be valuable, but the fatal and common error of not pointing it out, is again committed.

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58. For *Preparing Clay for Making Brick;* Jared G. Falcott, Glastonburgh, Hartford county, Connecticut, October 1.

(See specification.)

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59. For a *Double Dasher Churn;* William Sutton, Geneva, Ontario county, New York, October 1.

This is a new patent for an old machine, which we have more than once had occasion to describe. Two vertical shafts are made to revolve, each carrying dashers, which pass in the spaces between

the dashers of its fellow. The whole is clearly represented in the drawing, but there is no claim.

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60. For a *Machine for the Purpose of Raising Water and Acquiring Power;* Theophilus Somerby, Nantucket, Massachusetts, October 1.

To any one having the slightest claim to the name of machinist, or to any one acquainted with the elementary principles of motion, no more need be said, than that the plan proposed is to raise water by the action of the tide or current upon a small float wheel. The water is to be raised in buckets, similar to the hopper boys, used in flour mills; which water is afterwards to be employed in driving machinery.

The patentee probably expects to cheat the water out of a portion of its gravity, by coaxing it up an inclined plane, instead of raising it vertically. Should he succeed in doing this, there will be something new in his *invention.* We dare not add useful, because we are not quite certain that we should derive any advantage from abrogating the laws of nature.

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61. For *Machinery for Boring and Mortising;* Marcellus Sands, Franklin, Delaware county, New York, October 1.

This machinery is intended for boring and mortising hubs, and other articles. It is well represented and described in the drawing and specification. There is no claim made, and as the arrangement of the parts differ considerably from the machines previously patented for similar purposes, it is probably considered that the whole is new. Without the drawing, a description would not be intelligible.

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62. For a *Baking Iron, for the purpose of Baking, Toasting, or Boiling;* Elijah Skinner, Sandwich, Strafford, county, New Hampshire, October 1.

This is an affair made of sheet iron, and in form something like a cheese toaster. Its principal merit and *novelty* consists in its being more cheaply made than a tin kitchen. "What I consider as new," says the patentee, "and my own invention, is the construction of the instrument as described in the specification, cheap, and easy made, varying from a tin kitchen and boiler, so that one cheap instrument may supply the place of a cake block, toast iron, gridiron, and broiler."

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63. For a *Thrashing and Winnowing Machine;* Samuel Slater, Northern Liberties, Philadelphia county, Pennsylvania, October 1.

We will let the patentee tell for himself the improvements which he has made. After describing his machine, which we should be in danger of confounding with some others, he says, "the difference

between the plan and operation of this thrashing and winnowing, or cleaning machine, consists in this, that is to say; in the first place, the machine is constructed with a board flooring instead of a cloth apron, which is now used. The board flooring answers the purpose much better than the revolving apron, and is at the same time less expensive, and not liable to want repairing; or to being injured. 2nd. The beater revolving or throwing the dust from the person attending the machine, which is not the case in any former invention. 3d. The simplicity of the concave. 4th. The fan, the wind coming in contact with the beater, which prevents the straw from tangling. 5th. The whole machine is more simple, and precise in its operations, much better calculated for the farmer than any now in use, durable, and easily constructed, the price considerably less than others, which afford no competition with the above described. 6th. The machine is also admirably calculated for thrashing rice."

The foregoing novelties, are some of them old, and others intangible. The board flooring has been long and frequently employed. The beater throwing the dust from the person has been used in former machines. With respect to the cheapness, and other desirable properties of that kind, we have nothing to say, and will only add a curious kind of claim, which also belongs to the intangibles, "*the claims are the general merits of the machine.*"

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64. For a *Mode of Straightening the Splits or Dents for Weavers' Reeds,* by the application of heat; Jacob Senneff, City of Philadelphia, October 1.

(See specification.)

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65. For a *Thrashing Machine;* William Sperry, City of New York, October 1.

A cylinder and concave segment are to perform the work of thrashing. The cylinder is to be made of one solid piece of timber, driven full of flat spikes. These are to project about one inch from the wood, and to stand "diagonally each way." The concave segment is to be formed of any number of *slabs,* fluted lengthwise.

These are the particulars claimed; but we do not know by which of these features it is distinguished from other thrashing machines.

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66. For a mode of *Applying Power for Propelling Thrashing Machines,* turning lathes, furnaces, cider mills, or any such machinery; Augustus Sawyer, Hopewell, Ontario county, New York, October 1.

This is one of those contrivances in which, by multiplying the moving parts of a machine, those who have no solid knowledge of mechanics succeed in cheating themselves and others into a belief that they have made a discovery.

A horse is to turn a shaft, carrying a horizontal wheel, in the manner of the common horse mill. The cogs of this large wheel are to

mash into a trundle head; on the shaft of this trundle head there is to be a horizontal screw, of wood or metal. The threads of this endless screw are to turn a perpendicular cog wheel: on the shaft of this is to be another cog wheel; this last wheel is to turn "a large band wheel, which by means of a band attached, plies a small wheel with a great increase of *velocity*. To the axle of this latter is attached the machine necessary to be put in motion."

We have no doubt that this machinery will be as useful in "propelling furnaces," as in its application to any other purpose.

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67. For an improvement in the *Carding Machine;* Uriel Warner, Ripley, Brown county, Ohio, October 1.

We do not very well understand the description of this improvement. The object is to work the comb, in the operation of doffing, by a new arrangement of the parts which give it motion. This it is said to do more steadily, and with less power than the common method.

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68. For an improved *Water Wheel for Propelling Mills;* Clark Willson, Swanzey, Cheshire county, New Hampshire, October 1.

A vertical shaft is to be supported by suitable gudgeons. At the lower end of this shaft, there are bucket boards of wood, or other material, which bucket boards are let into the shaft, and are surrounded by a rim. Some idea of the form of this wheel may be obtained, by supposing the leaves of a smoke jack wheel to have a rim extending from face to face. On the upper face of the wheel the buckets have less inclination than at a distance from it, and are so curved, that on the lower side, where the water makes its exit, they are nearly horizontal. "The application of the water to the wheel may be by placing the wheel in the base of the floom, and giving the bulk of water free access to drop into and vent from the spiracles."

"The advantages of this wheel are the saving of a large portion of water; the omission in most instances of gearings in mills, &c.; the cheapness of building and repairing, and the free and uninterrupted operation of the wheel in flood water," &c. &c.

The mode of applying this wheel is very imperfectly described, the whole of the directions being comprised in the part above quoted. The claim is to "the particular form of the spiracles, [buckets,] or ventways, and the manner of applying the water to them."

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69. For a machine for *Thrashing Grain;* William J. Wood, Batavia, Genesee county, New York, October 1.

We opened the specification of this patent with the expectation of seeing another cylinder, and hollow segment, but found a machine new in its form, whether superior or not in its operation, we are not prepared to say.

Suppose a wheel, with spokes, like a coach wheel, and another of

only a few inches in diameter, to be connected together by an axis. These wheels, if rolled round on a floor, would pass round a point, in the manner of a cone. From the barn floor, on which the grain is to be thrashed, rises a vertical shaft, to which the axis is attached, at the end bearing the small wheel, or at the apex of the supposed cone. To a sweep from this shaft a horse may be attached, and the machine drawn round. The flails are formed of plank, and are as numerous as the spokes of the wheel, which in the drawing amount to 18. They rest against the spokes by their flat sides, their edges standing towards the rim and hub; they extend from wheel to wheel, being attached to the smaller wheel by pins, or otherwise, forming a moveable joint upon which they play. At the other end they are kept in their places by the rim and spokes of the large wheel. The levers, or flails on the upper side of the machine, rest upon the hub, but fall by their gravity, as it rolls round, and strike upon the wheat, or other grain upon the floor. The claim is to the application of power in this way, for the purpose of thrashing.

We should be apprehensive that these flails would not fall upon the straw with sufficient force, or directness, to accomplish the purpose intended.

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70. For an improvement in the *Construction of Saw Mills;* Joseph Newton, Sweden, Monroe county, New York, October 1.

The improvement proposed, is, to have teeth on both edges of a saw, and to construct the mill in such a manner that the log may be sawed in passing either way. There are to be two rag wheels, and two feed hands, operating in reversed directions.

We much doubt whether the advantages derived from this mode, in ordinary sawing, will compensate for its inconveniences. The plank must be cut entirely off, whilst in the ordinary mill they support each other until the last slab is taken off. If any mode of obviating this objection has been devised, it has not been presented to us by the patentee.

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71. For a *Hinge and Plain Stock*, for gentlemen's wear; Denison Williams, Albany, New York, October 1.

"Said improvement consists in making the hinge stock of different descriptions of fur and of hair seal skins, with an approved and new composition foundation consisting of hair or bristles, or either of them, supported by prepared elastic linen."

There is no drawing of the proposed stock, and the foregoing is the whole description; and if it is given "in full, clear, and exact terms," we know not what is deficient, obscure, and indefinite.

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72. For a *Machine for Cleaning Grain;* Michael Urffer, Upper Milford, Lehigh county, Pennsylvania, October 1.

The general form of this instrument is that of the Dutch wheat fan. Instead of the ordinary screens, or sieves, there is a cylindrical

revolving sifter, working something like a bolter, the grain passing in at one end, and out of the other, on to the inclined board, where the fan operates upon it. This is the principal alteration from the common arrangement.

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73. For an improvement in the *Hemp and Flax Dresser;* Ethan H. Nichols, of Hardwick, and Thaddeus Fairbanks, of St. Johnsbury, Caledonia county, Vermont, October 1.

The machine used is that constructed by Hines and Baine, and the improvement claimed is for pairs of rollers to be used with it, which the patentees call *dressers.*

These rollers have iron beaters extending from end to end, like the cogs of wheels; they are placed in pairs, with the leaves of one roller mashing between those of the corresponding roller.

This plan bears a very near resemblance to others which we have formerly noticed.

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74. For a *Churn,* called the "Float Wheel Churn;" Ebenezer Deevey, Butternuts, Otsego county, New York, October 1.

This is a sort of barrel churn, with an axis passing through it, having dashers placed upon it obliquely, and in reversed directions.

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75. For an improved *System of Procedure in the Drying and Curing of Tobacco;* Davis G. Tuck, M. D. Halifax Court House, Virginia, October 1.

The system proposed is founded upon the principle, that in order to preserve the valuable qualities of vegetable substances, which are to be desiccated, the process ought to be effected within a limited time, in order to prevent spontaneous decomposition; and that to effect this, the operation must be carried on at temperatures within the absolute control of the operator. The whole arrangement proposed by the patentee, is sufficiently simple to be carried into effect by ordinary hands; the principles upon which it is based, are obviously true, and the test of actual experiment has evinced its great value. We shall hereafter give an epitome of the specification, which is of considerable length.

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76. For *Wire Eyed Cast Buttons;* T. Festus Hayden, Waterbury, New Haven county, Connecticut, October 1.

The following is the substantive part of the specification.

"The wire eyed cast buttons for coat, vest, or other use, is made, stamped according to fancy, burnished and edged in the usual manner, and fitted to receive the cap, or shell, or rim required, which is prepared from the same materials, and put on and closed down in the same manner as is usually done on buttons with soldered eyes. "The wire eyed *cast* buttons may be prepared for inlaid work by an indentation in the face by a suitable stamp or die; or by a

projection in the face of the mould, or by raising the edge by passing through dies calculated for that object: when thus prepared, any fancy work of brass, or other ornamental metal, may be inserted and fixed in its place by the burnisher, or by a stamp with ornamental devices impressed upon the raised edge."

"I do not claim as my invention the method of making the wire eyed *cast* button. This has long been known and used: nor do I claim as any part of my invention, the method of making or preparing the cap, shell, rim, inlaid, or other ornamental work, attached to the face of other buttons as now known and used; but I do claim as my invention and improvement, the application thereof to the wire eyed *cast* button as above described."

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77. For an improvement in the art of *Manufacturing Malleable Iron from Pig Metal;* Thomas Cotton Lewis, Pine Creek, Alleghany county, Pennsylvania, October 1.

(See specification.)

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78. For *A Cylindrical Grate Cotton Whipper;* James S. Simmons, Scituate, Providence county, Rhode Island, October 1.

This cotton whipper consists of a cylindrical grate placed vertically, and inclosed in a wooden box. A shaft passes down through the centre of the cylindrical grate. Arms project from this vertical shaft, and others called fingers, project from the interior of the cylinder, in such a manner, that when the shaft is made to revolve, its projecting arms may pass between those on the cylinder.

The cotton is fed into the cylinder, where, by the rapid motion of the shaft, it is beaten and opened; the seeds and other foreign matter being principally driven out through the grating of the cylinder. There is, of course, a suitable opening for the delivery of the cotton.

The claim is to the cylindrical grate; to the fingers inserted within the grate, or cylinder; and to the shaft passing through the cylinder, and having two, three, or more arms inserted in it.

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79. For an improvement in the *Mode of Manufacturing Combs;* James Pitts and Cyrus Houghton, of Lancaster, Worcester county, Massachusetts, and Joseph Rice, Jr. of Scituate, Rhode Island, October 1.

This patent is for "a machine for grinding comb stocks, and making combs."

"This improvement consists in several things. *First*, in grinding or preparing the stock for combs, doing that part of the work by machinery, which hitherto has usually been done by hand. *Second*, in a better method for smoothing the teeth from the back, or quill of the comb, to the end of the teeth. *Third*, in a better method of pointing, or rounding the teeth."

A common coarse grit grindstone is used to reduce the horn, &c. to a proper surface, there being under the stone a suitable support

and slide to hold and manage the pieces to be so ground; water is to be allowed to run upon the stone during the operation.

The ends of the teeth, and the rough ends of cut combs, are also to be smoothed by grinding. A third stone, with grooves on its face, is used to smooth the teeth. The stones in the two latter cases are to be used dry. The claim is to the *process of grinding* in the manufacturing of combs.

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80. For *A Churn;* Samuel M. Parsons and Sereno Dickerman, both of Meriden, New Haven county, Connecticut, October 1.

A very formidable specification introduces us to an acquaintance with this churn. The dimensions of every part is given with great precision, and the final claim is to "the combination of the various parts of the machine in the manner aforesaid, to produce the compound motion, and thereby the result."

The trough to contain the cream is semi-cylindrical; above which there is a shaft, to which the dasher is affixed, and the lever by which it is to be worked; this lever being acted upon by hand, causes the dasher to vibrate in the trough.

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81. For a *Circular Car Receiver;* Jonathan Crane, of the City of Schenectady, New York, October 1.

We are informed that "the utility of the circular car receiver, consists mainly in the facility which it affords in removing the car, or other vehicle, from one rail to the other. It is believed that important advantages will be derived from its use in removing ponderous bodies of earth from hills into vallies, and that it can be applied with great advantage in graduating for rail-roads; and at the termination of rail-ways, in removing the car, or other vehicle, when loaded or empty, from one rail [track] to the other, whether the rail-ways are parallel, or at right angles."

The principal object of the patentee appears to be to aid in the construction of rail-roads, where embankments are to be made. Suppose a double track to be laid along the embankment so far as it is completed; these tracks are to be connected together by means of a semicircular platform, which is placed a little below the level of the rails. A carriage, upon rollers, is adapted to this platform, which carriage is of such a height as just to reach the level of the rails. A lever, or sweep, is attached to this carriage, for the purpose of carrying it round from one track to the other; this it accomplishes by its working on a pin, or fulcrum, placed between the two tracks, and in the centre of the curved platform. A car, bringing earth, is received upon this carriage, and by means of the lever, it may be carried round so as to return by the other track; and a succession of cars may thus be employed, without their interfering with each other. The earth, or other material brought, may be shot down, or unloaded, whilst the car is on the circular platform, or in any required part of its journey.

82. For an improvement in the *Spinning Machine;* William Clark Pultney, Steuben county, New York, October 1.

It is some time since we have had before us any of those domestic spinners, which in former times were made the subject of patents in considerable numbers. The reduced price at which the products of our manufactories are now afforded, renders it doubtful whether machines of this description can be advantageously used in many situations. But few of those which have been patented, have any claim to originality of invention; it is only upon the particular arrangement of the parts, *if upon any thing*, that a claim could be sustained. The machine above named does not possess any novelty which we can perceive; and upon this subject the patentee has not attempted to enlighten us, as he merely describes his machine, of which he has furnished a very indifferent drawing, without claiming any part as his invention.

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83. For sundry improvements in a *Printing Machine*, called a Power Printing Press; Isaac Adams, Boston, Massachusetts, October 4.

We cannot pretend to give any description of this machine, which, in the specification, occupies ten pages, and is accompanied by large and complicated drawings. The points claimed, are, "the combination of stationary fly frames, with points for getting register by, on them, with printing presses."

"The object of these fly frames, is, to enable the person who lays on the paper to point one sheet, while the sheet previously put on is receiving the impression, and by that means save the time which would be lost in waiting for a frisket to come out."

An apparatus for giving a periodical movement to the rollers and friskets, as described in the specification, and the use of what the patentee calls declension levers, are also claimed.

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84. For a *Vibrating Flour and Powder Separating Machine;* Benjamin Culver, Glastonbury, Hartford county, Connecticut, October 6.

This apparatus consists of several sieves placed one over the other, increasing in fineness as they descend. The sieves are to be suspended by leather straps, which allow a vibrating motion to be given to them. The contents of each sieve is to be discharged upon a separate, inclined board, and thus conducted to its proper receptacle. The patentee says, "what I claim as my own invention in the aforesaid machine, is the whole of it as applicable in the manner above specified."

As sifters of the kind above described have been long known and used, in several different manufactories, we are of opinion that the claim to the whole machine is altogether unfounded. It is a principle well established in law, that the taking a known machine, and operating by it upon a material to which it had not been previously

applied, is not an invention, or discovery, such as to entitle any one to an exclusive right.

If the sifting machine was not *invented* by the present patentee, it was no *discovery* that flour and powder, as well as drugs, and other pulverized articles, might be sifted by it.

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85. For an improvement in the *Construction of Saw and Grist Mills;* William Prim, Lebanon, Wilson county, Tennessee, October 6.

The proposed improvement consists in the application of spiral wheels to saw and grist mills. When used for a saw mill, the spiral wheel is to be placed with its axis standing horizontally; the wheel running in a trough, or curb, into one end of which the water enters from a penstock. The pitman is to be attached to a crank on the shaft of the wheel. When used for a grist mill, the shaft is to stand vertically, with the stone placed as in the common tub mill. The claim is to the mode of applying the spiral wheel.

The patentee avers that a wheel of this description may be driven with one-third of the quantity of water necessary to wheels of other constructions. We are of opinion that those wheels with which the spiral wheel has been compared must have been of a very indifferent kind, as we know of no plan much better calculated to lose power than those water wheels which act on the spiral principle.

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86. For an improvement in the *Springs of Carriages, and in the method of attaching the Bodies of Carriages to the Springs;* Joseph Ives and James Walters, Brooklyn, Kings county, New York, October 6.

The springs used by the patentees, are straight springs attached to the perch, or other frame work of the carriage. They extend out in a line with the carriage before and behind, being horizontally, and being bolted down at their inner ends. To their outer ends a rope, chain, or band, is attached, which rises up, and passes over a pulley, to which the other end of the rope, chain, or band, is fastened. The pulley is fixed upon a shaft, the gudgeons of which turn in two standards, framed in the carriage for that purpose. Other pulleys are fixed on the ends of the shaft, from which ropes, chains, or bands extend, and are attached to the body of the carriage.

When the body is hung, its weight tends to turn the pulley, to which it is attached by the ropes or bands, and in doing so the pulley connected with the springs raise them from the frame work on which they rest.

The claim is to this manner of suspending carriages.

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87. For an improvement in the manner of *Constructing Bands for Carriage Hubs;* Samuel K. Miller, Elizabethtown, Essex county, New Jersey, October 7.

The whole description is comprised in the following words.

"The band consists of an iron or copper ring, on to which the beard, cap, or moulding of brass, or other metal or metals is cast, soldered, or fastened by other means. The extent of your petitioner's claim is the iron or copper ring when attached to, or finished with other metal as above described, whereby much greater strength is produced with less weight and bulk than those now in use, of entire brass: on which rests your petitioner's claim."

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88. For *Machinery for Dressing Staves;* William Thomas, Pomfret, Chautauque county, New York, October 7.

The description of this machinery has the same happy brevity with the last mentioned invention: it is as follows.

"The reacting stave dresser consists of two half circles, connected so as to let the stave pass between them, with two or more knives attached to them, so as to dress the stave on the outside and inside at the same time, the knives cutting both ways. The stave is made fast at both ends by dogs, which are attached to a carriage that passes outside of the circles. The semicircle is propelled back and forth by a pitman attached to it from a crank."

By turning to page 77, of the last volume, it will be seen that Mr. Charles B. Goodrich, of Rutland, Massachusetts, obtained a patent, on the 10th of May last, for a machine acting upon the principle above described. Of this machine we thought very favourably; of the originality of inventorship we know nothing.

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89. For a *Locomotive Carriage;* William Heston, Philadelphia, Pennsylvania, October 11.

This locomotive carriage is intended to be propelled by a lever to be worked backwards and forwards by hand, which lever is to operate upon ratchet wheels placed upon one of the axles.

Much stress is laid upon this carriage being worked by *lever power;* and there is evidently an idea entertained by the patentee, that there is some great gain in thus working it. We are informed that "the principle may be applied to the working of all kinds of machinery, and particularly boats, and rail-way cars, by manual or steam power." No doubt it may, but what there is of novelty, or what advantage is to be derived from this particular mode, we are not told, and do not know.

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90. For an *Elevating Bedstead,* for the use of invalids; David Boncroft, Grafton, Windham county, Vermont, October 12.

The upper half of the frame and sacking bottom is made to raise up to any desired angle, by means of pulleys and a rope, which are represented under two or three different modifications, differing but little from former modes of effecting the same object.

Specifications of American Patents.

Specification of a patent for a Self-adjusting Rail-road and Street Car, with Guide Rails adapted to the same. Granted to John Pollock, *of Hopewell, Lower Oxford, Chester county, Pennsylvania, October* 1, 1830.

To all to whom these presents shall come, be it known, that I, John Pollock, of Hopewell, Chester county, Pennsylvania, have invented new and useful improvements in the rail-road and street car, with guide rails adapted to the same. This car I denominate the self-adjusting rail-road and street car, as it is designed to adjust itself to all the ordinary purposes of transportation, on either rail-roads, common roads, or streets, or to turn out from one rail to another, as necessity may require, which objects I effect by the guiding apparatus attached to the fore axle, or bolster of the car, and by placing at the intersection of common, or termination of rail-roads, a simple system of guide rails, which acting simultaneously on the guiding apparatus, attached as aforesaid, enables the car, on leaving the rails, to adjust itself to the common road, or street; or, on leaving the common road, or street, to adjust itself to the rail-road, or turn out, from one rail to another.

Also by a new mode of coupling, the wheels are made to track, or follow each other, in either a straight, or curvilinear direction. By the combined agency of the guiding apparatus and coupling, the use of flanches is avoided. And that the following is a full and exact description of the same, reference being had to the drawings which accompany this specification, and which make part thereof. The bed and wheels may be of the general construction in ordinary use, except that in the mode of guiding and coupling the cars, which I use, (as before observed,) the use of flanches on the common wheels is dispensed with. The peripheries of the wheels are made broad to admit of casual deviations in their motions, or accidental variations in the width of the rails. The axles on which the wheels revolve, are made of iron, and fastened under the lower bolsters which support the bed. In the centre of the hind bolster is a hole in which is a bolt, with a head, or shoulder on which the bed rests. In the centre of the fore bolster is a similar hole with another bolt, or pin, which supports the fore part of the bed. On this bolt is a large broad head, in which are two grooves, or openings, at right angles to each other. The groove parallel with the bolster is to give play, or rocking motion to the bed. The other groove which is parallel with the bed is to admit a horizontal pin which is made fast to the bed, and acts as a pivot on which it may rock, (as above alluded to,) when the wheels are passing over unequal planes. The coupling which I use, may be applied either to a single pair of axles, (as for one car,) or an indefinite number, when many cars are designed to be attached together. It is formed by two rods placed obliquely, and crossing each other in the centre. These rods are connected to

the axles or bolsters, at or near the same, by a joint or pivot on which they turn freely. The rods form tangents of circles, the bolts which support the bed being the centre of the circles. The same radius is used at each end of the coupling, and should be equal to about one-fourth of the length of the axles, inside of, or between the wheels. The joints, or pivots, being placed at the intersections of the radii and tangents.

The rails on which the car is to run may be of either wood or iron, of the common construction, and modes of fixtures, except the guide rails which will be hereafter described. The self-adjusting apparatus for bearing against the sides of the rails, is constructed as follows. There are two levers, or fender rails, (equal in length to about half of the distance between the two main axles,) connected to the fore axle, or bolster, near the wheels, by two short projecting pieces forming pivots for them to work on. The other ends of them project forward, their line of direction forming an angle more or less acute with the plane of the road, on which the car is to travel. They may be connected firmly by cross bars, or braces, or in any other way by which they will have advantage to traverse the axle under the bed, thereby adapting the periphery of the fore wheels to the inclination of the rails. The outer ends of these fender rails, (or guide levers,) are fended from the rails by the interposition of wheels, for the purpose of reducing the friction. These wheels are retained in a horizontal position, as near as possible, (when elevated or depressed,) by attaching them by their axles to the lower ends of upright slings. These slings have in their upper ends an opening, or slit, to admit of their moving up and down on pins, which are attached to the ends of suspending gallows that are made fast to the axle or bolster. The lower ends of the slings are connected to the fender rails by a small axle, or rod, passing through them, on which they have liberty to work. This axle also has two small wheels on it for the purpose of reducing the friction when rolling on the inclined planes of the guide rail, thereby raising or lowering the adjusting apparatus. To secure the adjusting apparatus, either up or down, there are two dogs formed on the principles of the hammer lever; the angles, or fulcrums of which, are connected to the fender rails on one side, by a pivot, on which they work, at a distance from the outer ends of the fender rails, equal to about one-third of their whole length. One end of each hammer lever extends upwards, with a projecting knob on it, for the purpose of catching and holding against the edge of a mortise, or pin, in the suspending arm, or gallows. The other ends of these levers project forward along side of the fender rails, for the purpose of being elevated by the guide rails, or being depressed by their own gravity. The outer extremity of the whole self-adjusting apparatus, as above described, is suspended and retained in its proper position by the bed, on which is a small piece projecting downwards with a slit to receive a slider, which is made fast on the gallows, thereby allowing the lateral movement of the adjusting apparatus; or the same purpose may be effected by a similar contrivance of a slider and gallows on the opposite side of

the fore axle in connexion with the bed, or coupling rods. It will be seen from the above arrangement, that any lateral effect produced on the outer extremity of the self-adjusting apparatus will cause the fore axle to traverse on its centre bolt under the bed, and from thence the motion is communicated by the coupling rods to the hind axle, causing it to move on similar lines and angles to those described by the fore axle. The guide rails, (to answer the purpose before alluded to,) are placed parallel with, and between, the common rails, on a platform which is in the same plane with the common rails. The ends of the guide rails next the intersection of common roads, or streets, are curved, and may meet. Their upper sides are parallel to the plane of the platform, or road, on which they are laid. The other ends form inclined planes on their upper sides, which inclinations extend about half of their lengths, and terminate in an elevation a little above the horizontal ends. There is also a projecting lip, or edge, extending along on the outside of the inclination in the same plane with it, as far as the highest part where the inclination of the lip or edge is reversed.

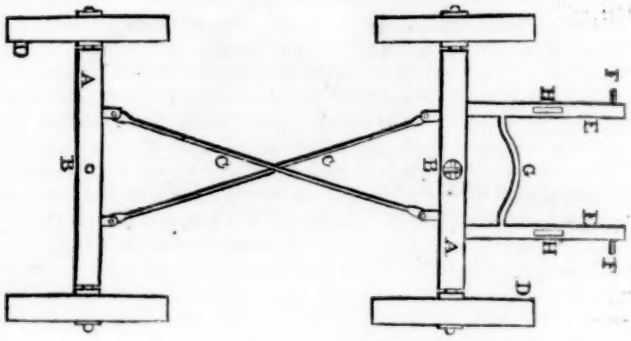
The simultaneous movements of the self-adjusting apparatus, when it is passing off from the rail-road, are accomplished in the following order. The upper ends of the dogs are released from their hold, on the under side of the gallows, by their lower ends ascending the projecting lip, or edge of the guide rail, at the same time the fender levers and wheels are elevated by the inclined plane to their summits, and suspended by the upper ends of the dogs catching on the upper sides of the gallows, as the lower ends descend the reversed inclination on the summit of the lip, or projecting edge of the guide rail. When the car is returning to the rail-road, the fender wheels come first in contact with the horizontal ends of the guide rails, which direct the car on to the rails again, when, by the simultaneous agency of the adjusting apparatus, the fenders are depressed to their former position, by the same causes which effected their elevation. What I claim as new, and my invention or discovery, in the foregoing discovery, is, first, the self-adjusting or guiding apparatus, attached to the fore axle of the car, by which it is made to answer the several purposes hereinbefore described. Second, the tangent coupling or connecting rods, as before described. Third, the guide rails placed at the intersections, terminations, &c. of rail-roads, to answer the purposes hereinbefore described.

I wish it to be understood that I do not claim the exclusive privilege of using guide wheels, neither of shifting them, but only their use in connexion with my self-adjusting apparatus as connected with the car. I do not deem guide wheels to be necessary for the hind wheels of my car; but, if required, they may be made to operate upon the same principle as those of the fore wheels.

JOHN POLLOCK.

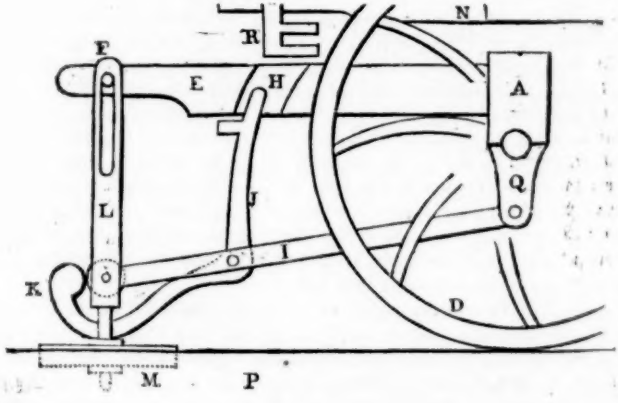
DESCRIPTION OF THE DRAWINGS.

Fig. 1, *top view of the carriage.*



A, A, the bolsters and axles. B, B, the centre bolts. C, C, the coupling rods. D, D, wheels. E, E, the gallows, or arms. F, F, pins for the slings to move on. G, the slider. H, mortise or slits in the slider.

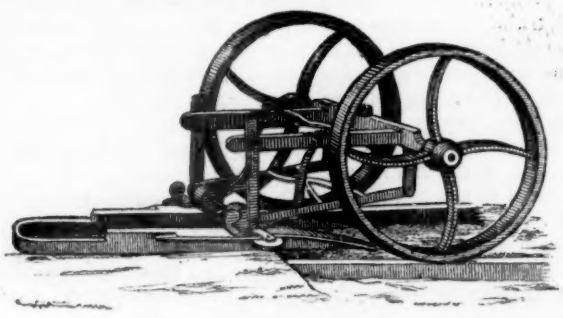
Fig. 2, *side view of part of one of the front wheels, and of the principal adjusting parts.*



The same letters refer to the same parts in both the figures.

I, fender rails. J, the upper end of the dog. K, its lower end. L, sling attached to the fender rails. M, fender wheels. N, bed sill. P, road rails. Q, projecting pieces forming pivots to the fender rails.

Fig. 8, the fore wheels of the carriage and the guide rail shown in perspective.



Remarks on the Self-adjusting Rail-road and Street Car. By the PATENTEE; *together with some observations upon Rail-roads.*

THE advantages of the "Self-adjusting Rail-road and Street Car" will be more evident, when the many objections to the using of flanches are fully considered; which objections have arisen from experience in their application. It need scarcely be remarked that they are the only means hitherto adopted, generally, for confining the car to the rails. That they have not answered the purpose for which they were intended, as satisfactorily as is desirable, all will admit, who have any experience in their application to rail-roads. They are not only subject to a great amount of friction, by their lateral pressure, against the rails, but this pressure, which creates the friction, is, itself, an evil of no common magnitude, as its effect is to loosen and spread the rails. The cause of this effect is too obvious to need illustration, and its truth is confirmed by the frequent repairs requiring the re-securing of the rails; and the evil will increase with the curvature of the road, as the axles are necessarily placed parallel to each other. They cannot form the radii of the curve on which the car is to move. The rubbing of the flanches will also be increased by increasing the length of the car, and the distance of separation in the axles, as the farther the axles are apart, the more they will deviate from the radii of the curve. This must be an evident defect, as it will render the cars unfit for the transportation of timber, lumber, &c. which will form a great part of their use in this country. That this objection has not been so often repeated, is to be attributed to the almost exclusive use to which rail-road cars have hitherto been applied, viz. the transportation of stone coal and passengers, in which short coupling only is required.

2. As the length of the car is increased, it will be of great importance to increase the distance between the axles also, and that the distance between the wheels of a train of cars, be as nearly equal

as possible, to give them an equal bearing on the rails, and divide their weight equally on them. To accomplish the same purpose, it will be an advantage to load the cars lightly, and have the more of them in train. The rails may also be injured from another cause. The wheels being made fast on the axles, each of them must perform the same number of revolutions; now it is evident, that, on curved roads, this will not be required; and one of the wheels must *slip* and *rub*, thereby creating additional friction, and injury to the rails, as before alluded to. Again, the bed not having liberty to rock on one of the axles, is another source of injury to the rails. The axles being confined to the bed, (though they are permitted to revolve,) will cause all of the wheels to form the same plane with each other on their under edge. Now if the rails in the same part of the road are not on the same plane with each other, (and they are not easily made so at first, and still less easily kept so,) the two diagonal wheels will have to sustain all the weight of the load, consequently the wheels, axles and rails, will have to be stronger than they need otherwise be, and the rails liable to be loosed from their bearings.

3. It will be seen, by a reference to the foregoing specification, that none of these disadvantages accompany the "Self-adjusting Rail-road and Street Car." And that it is not only free from these defects, but is in possession of many valuable properties heretofore unemployed in the construction of rail-road cars. I am the more convinced of this fact, from the undivided opinion of many scientific gentlemen who have examined it at various places where I have exhibited it, and who unanimously concur in ascribing to it such advantages and peculiarities of economy as will warrant its introduction into almost any section of the country. Should any object to the means of confining the car to the rails, on the grounds that it will be insecure, I would answer that they are quite as efficient as that of the flanch. The guide wheels being confined down between the rails, have a controlling power over the other wheels, equal, if not superior, to the flanch, as they are not so liable to be raised out of their places by the lateral pressure as the flanches are, and moreover, the principal wheels being made very broad on the edge, or tread, easily assumes the curves of the rails by the adjusting apparatus having adequate advantage over them.

Any lateral effect by the line of traction, is easily overcome by having a short tongue made fast to, and projected from, the axle as far as the guide wheels, when the end of it may connect the propelling power, by means of a swivel joint, which will bring the lateral pressure directly against the side of the rails by the guide wheels. This supposed defect may be effectually obviated by making the wheels broad on the tread or edge. I should say six or eight inches would be sufficient to admit of any variations in their course, in traversing the rails. This object may also be effected, (as suggested in the specification,) by attaching the system of adjusting apparatus to both ends of the car; and thus the traversing of the axle may be limited to suit the curve of the road which has the shortest radii.

And thus it will be seen that any direct lateral effect against the car, cannot remove it without breaking some of its parts.

4. The fact of its combining the properties of a rail-road and street car, must greatly enhance its value, as articles transported on this car can be carried (off the rail-road into towns, villages, &c.) without unloading, immediately to their place of destination. Consequently, thereby saving an immense amount of labour, expense, and time. Another valuable property arising from this peculiarity of the car, is, that it will cross a common road turn-out from one line of rails to another, without difficulty or delay, and with any required facility by the self-adjusting principle, which principle will be found an important feature in this car. All that will be requisite to enable this car to cross any common road, will be a short platform of plank at the termination of the rails, and side of the common road, to support the guide rails, which are united with the common rails, at crossing places and terminations. Another important feature in the construction of the "Self-adjusting Car," is its adaptation to roads of any curvature, thereby rendering it practicable to avoid the necessity of levelling down hills, as they can be surmounted by winding the road along their sides. The distance, also, between the axles, may be increased to any length, without increasing the friction by the lateral bearing against the curved rails.

5. Another advantage, no less valuable than the foregoing, is anticipated from the introduction of this system. As the rails are not liable to injury from any lateral pressure, and as the extension of planes offers no resistance to rolling bodies, and for the same reason bodies in contact will be less indented by a given pressure, it is obvious that a wooden rail four or five inches broad, would be as little indented by the perpendicular pressure of the wheels as iron plates two inches broad and one-half thick, (which are the usual dimensions, and will cost not less than one thousand dollars per mile, for a single track or line,) and of course may be substituted for the iron. I can speak with more confidence on the comparative advantages of wooden rails, with those of iron, from numerous experiments with a car one-fourth the common size, and two sections of rails, one of wood, the other faced with iron. The car was loaded with three times the proper weight, and run back and forward many hundreds of times, without the lest perceptible difference, and an increase of weight only increased the resistance to the moving power, in the same ratio, which shows that the increase of resistance was the result of friction at the axles. Iron, however, may be used where it can be procured, but its expense would be, in many places, an insurmountable obstacle to the use of rail-roads.

6. The reduction of friction at the main axle, is a subject which many have attempted to accomplish. Secondary, or friction wheels, have been, by some, thought to answer this purpose. They may, if deemed expedient, be applied to this car, with the same effect as any other. I, however, do not recommend them, as their advantage will scarcely warrant their introduction. They have been long before the public, and their merits are fully known. Their chief re-

duction is supposed to exist in the rolling movement they give in place of the slipping one. This seeming advantage is not without its difficulty. The point of contact between the main axle and the friction wheel is so small, that they are easily indented or bruised, in which case they increase what they are designed to diminish.

7. The only resistance to be encountered on level roads, is friction, but as a horizontal plane is not to be expected in the location of rail-roads of any considerable length, another resistance will be to encounter from gravity. A power which will keep the car in motion on the plane, will be insufficient to propel it upon a slight inclination. This will be better illustrated from the following statement. The usual abatement made for friction is one pound to every two hundred of the load. The resistance of gravity will be as the length of the plane exceeds the altitude. In an inclination of 6 inches to the 100 feet, or 26.4 feet to the mile, the resistance from gravity and friction would be 2 pounds; double this inclination, and the resistance will be 3 pounds to every 200 of load, (one-fourth of the load is deducted for the weight of the car, although it is here included,) triple the first inclination will give 4 lbs. to 200. Now if we admit 112 lbs. for a horse power, he will draw on a level 10 tons, and on the first inclination cited above, he will draw 5 tons, on the second $3\frac{1}{3}$ tons, on the third $2\frac{1}{2}$ tons. From these facts it appears that only one-fourth of the resistance in the last result is from friction. This shows that large expenditures in the reduction of friction are not commendable. The ordinary wheel and axle will, in most cases, be the safest, especially if the journals be steeled, and well hardened and polished.

8. The material used in the construction of the principal wheels, should, I think, be cast iron; it is the most durable, and susceptible of the neatest conformation. Caution is necessary in the forming of the arms or spokes, to guard against the contraction which they undergo while cooling in the mould. Small castings contract more in proportion to the quantity of metal than large ones, and as the arms are less than the rim, they are subject to this inequality, as may be seen in the expansion and interstice when they are broken. To remedy this defect, I would make the arms crooked, or curved. The radius of the curve equal to that of the periphery of the rim. This allows the arms to give, or expand, to suit the rim.

9. In the construction of our rail-roads, we have taken England as a model after which to copy, without ever asking the question, whether her plans were adopted from motives of policy, or necessity. This appears to me preposterous. England, it is known, uses iron rails, but may this not be accounted for from the fact, that she has iron in greater abundance than timber. In the United States, the reverse is the fact. Here, population is dispersed over an immense extent of territory, while England is small, and her population dense. To connect the principal cities of the United States would require tenfold the extent of rail-road that it would require to connect those of England. Hence it is obvious that if we would enjoy the use of rail-roads extensively, we must adopt some plan less costly than that

of iron. Wood offers a ready substitute; timber, as fine as the world produces, abounds in our country, which may be procured so cheap, that to make a wooden rail-road would cost but little more than to make a good road for ordinary carriages. These wooden rails may be confined to the ground either by sills of timber laid at right angles, with grooves in which the rails may be imbedded and made fast by keys or bolts; or they may be supported on posts of wood sunk in the ground sufficiently deep to be undisturbed by the effects of frost. Timber which will admit of splitting into pieces of 6 or 8 inches square, will be found the best, as trees which will quarter that size, and are sound, may be considered in their prime. The juices which all kinds of timber contains, and which is a great means of its early decay, should be expelled by kiln drying. This is a cheap and easy process, and would increase the durability twofold. Farmers who have taken the precaution to season well their posts for fencing, will testify to the truth of this observation. Posts have this advantage over sills; where steam power is used, the expense of levelling may be greatly diminished, as the posts may be raised to a considerable elevation above the ground; and this elevation would also be an advantage, as it would tend to keep the rails free from the effects of gravel and frost. Where suitable stones could be procured and set in the ground endwise, with holes drilled into the upper ends by which to secure the rails, they ought to be substituted for the wooden posts.

10. These posts, whether of wood or stone, should be well set into the ground, and secured by ramming a large quantity of broken stones, or pure gravel, around them, and may be placed at intervals of 8 or 10 feet, provided the rails are 8 or 10 inches deep. The rails may be confined to a proper width apart, by small scantling extending across, and made fast to them. The width of the rails should be about 5 feet from centre to centre, or 4 feet 8 inches between them.

11. It now remains for an intelligent community to decide how far these remarks are applicable to the state of our country, and whether we shall wait until able to construct iron rail-roads, or lay hold of the means now in our power, and employ wooden rails, which will ensure, before they are worn out, sufficient capital to construct those of a more durable material. I am firmly persuaded that were we to adopt the foregoing system of car and rail-road, we should so far convince the public of their advantage in a general and commercial point of view, as to insure capital sufficient to construct rail-roads of any description. The great mass of the community are not aware of their advantages, and are not willing to risk their capital in a speculation attended with such enormous expenditures as that of establishing iron rail-roads, while they would willingly contribute to the formation of a wooden one of trifling cost.

Respectfully, yours,

JOHN POLLOCK.

Specification of a patent for an improvement in the manufacture of Reeds for Weavers. Granted to JACOB SENNEFF, *of the City of Philadelphia, October* 1, 1830.

To all whom it may concern, be it known, that I, Jacob Senneff, of the city of Philadelphia, have invented a new and useful improvement in the manufacturing of reeds for weavers, in which heat is applied for the purpose of straightening the splits or dents preparatory to their being set in the reed, and that the following is a full and exact description of the process, and of the machinery by which the same may be effected.

In accomplishing the end proposed, I proceed upon the well known facts, that wood, or cane, or strips of either, confined in any form, and then submitted to the action of heated water, or steam, or in any way heated, when imbued with moisture, and afterwards dried, will retain the form given to it, whether curved or straight.

I take the strips, or dents, prepared in the usual way for making reeds, and after soaking them in water, arrange them in rows, either upon boards or metallic plates, prepared to receive them, placing them flatwise together, and extending them along nearly the whole length of the board, or plate. Two or more rows may be thus extended, according to the width of the board, or plate, upon one end of which there should be a projecting cleet, or ledge, to sustain them. I cover any convenient number of boards, or plates, in this way, and place them over each other. I then place them in a frame prepared for the purpose, in which pressure may be made upon them, by means of screws, wedges, or otherwise. When thus pressed, they are submitted to the action of heat, and then perfectly dried, which, if necessary, may be quickly done, by placing the whole in an oven.

For the purpose of giving a practical view of my mode of procedure, I have accompanied this specification with a drawing of the press in the form in which I now employ it, not intending to confine myself to this particular construction, as what I claim is not the form of the press, but the process for straightening splits for reeds, upon the principles above described, that is to say:

I claim the mode of straightening splits, or dents, for weavers' reeds, by the united aid of heat, moisture, and pressure, between flat plates.

JACOB SENNEFF.

Specification of a patent for an improvement in the preparing of Clay for Making Brick. Granted to JARED G. TALCOTT, *Glastonbury, Hartford county, Connecticut, October* 1, 1830.

THE machine for preparing clay for making brick, is a cylindrical tub open at the top, fixed on a firm platform, with a perpendicular shaft passing through the centre, resting in a socket on a supporter beneath the platform; having a sweep attached to the head of it, for the purpose of causing it to revolve by horses, or other power.

The tub is filled about two-thirds of its depth from the bottom up, with square bars of iron, about four inches apart, passing from side to side, and secured, with the angles of the squares vertical and horizontal, intersecting each other with a small angle, and leaving room in the centre for the shaft. The main body of the shaft is an eight square timber, through every square of which are driven bars of square iron about four inches apart, and in length nearly the diameter of the tub. These are drawn out into horizontal knives, gradually commencing about one-third the distance from the shaft, to the extremity; and these knives are so disposed as to pass through in the revolutions of the shaft, every intermediate space of the horizontal bars in the tub, or cylinder.

By the means of successive revolutions of the shaft with the knives, the mixture of sand and clay, or clay alone, is perfectly prepared, when it reaches the bottom of the tub, where it passes off fit for moulding, through an aperture, into a platform, where the striker stands to perform his labour without any removal of the preparation.

The improvement claimed in the machine, is, the placing the bars and knives in such a position as to clear it from all obstructions of roots, grass, and other substances incidental to clay, without stopping its operation, merely by reversing its motion, which effectually prevents delay, and is a great saving of labour, as well as preparing the clay better with less expense than any machine hitherto used.

JARED G. TALCOTT.

Specification of a patent for an improvement in the art of manufacturing Malleable Iron from Pig Metal. Granted to THOMAS COTTON LEWIS, *Pine Creek, Alleghany county, Pennsylvania, October* 1, 1830.

I DO hereby declare that, according to the best of my knowledge and belief, I am the original and sole inventor of an improvement in the manufacture of malleable iron by means of a reverberatory furnace for melting and refining the pig metal, without the aid of bellows, or the necessity of coaking the mineral coal. Hitherto, the pig metal has been refined by means of a blast run out refinery, heated by mineral coal coak, or the char of wood; and in consequence of the pig metal being laid, (stratum super stratum,) upon the coak, they melt down together, and the impurities of the coak must, more or less, incorporate with the metal while in a state of fusion. The method I have adopted, will obviate those evils, as well as be a considerable saving to the manufacturer.

A reverberatory furnace is first provided, fifteen feet long in the clear, by four feet wide; the grate, or fire-place, is three feet long, by four feet wide; the body of the furnace is nine feet long by four feet wide; the neck of the furnace leading into the stack is eighteen inches long; the bottom of the stack, or flue, is eighteen inches square, making the whole inside length fifteen feet; over the flue stands the stack, which is thirty-five feet high by eighteen inches

square in the clear. On the side, or front of the furnace, and centre of the grate, stands the stock hole of nine inches square, for introducing the mineral coal into the grate. Upon the same side, or front, and the middle of the nine feet length, is a door for introducing the pig metal, which door way is twenty-two inches wide by eighteen inches high. A door of cast metal is made to shut up said door way, as soon as the metal is introduced, that as little air as possible may be introduced into the furnace. In the centre of the door, and at the lower edge, is an opening of five inches high by three inches wide, for the purpose of agitating the metal while in a state of fusion; while the metal is melting, said hole, or opening, is stopped up by a brick, or piece of cast metal, made to fit such opening. In the body of the furnace, opposite the door way, is the basin for receiving the melting metal, which is ten inches deep below the door way, or fore plate. Said basin is two and a half feet diameter at the bottom, to slope gradually from the upper part, or face of the bottom. Said bottom is made of coarse sand of the silecious kind, and the clearer such sand is of alumine, or calcareous matter, the better it will endure the heat of smelting. When the furnace is sufficiently heated for melting, ¾ to one bushel of charcoal is to be introduced into the basin through the door way; after which, one bushel of forge, or hammer cinder, previously made, which cinder is to cover the charcoal previously introduced. After which, eighteen or twenty hundred weight of pig metal is introduced, which is carefully to be laid round the basin, leaving spaces, if possible, between all the pigs, for the action of the flame to facilitate smelting. As soon as the charge of metal is introduced, fresh coals are to be thrown into the grate, the fire well stirred up, and the stock hole closed with small coal, to prevent any current of air introducing itself that way; in fact, no air ought to be let in if it can be prevented, otherwise than through the fire from below the grate. The fire being well kept up for the space of an hour, the metal will have nearly melted; as soon as the workman perceives that to be the case, it will be necessary for him to introduce an iron rabble into the furnace through the opening in the door, and draw the whole of the metal from the sides, into the basin; then introduce ¾ to 1 bushel of charcoal upon the face of the metal in fusion. The fire must be kept up as strong as possible, and the metal frequently agitated with an iron bar or rabble. In half an hour after the whole is melted down, it will be sufficiently decarbonized to let it run out through the tapping hole which is upon a level with the bottom, or ten inches below the fore plate, or door sill. Cast metal boxes are prepared, about 3¾ inches deep, 20 inches wide, and 10 or 12 feet long, and placed below the tapping hole to receive the metal; in half an hour such refined metal will be ready to take out of the box, and hauled out of the way.

Much depends upon the skilfulness of the refiner, in depriving the metal of its carbon, and, at the same time, to prevent too great an oxidation from taking place. If the metal is sufficiently fluxed, the texture will be clear, and more or less branching like the fibre

of an oak leaf; with from ¼ of an inch to an inch of honey comb appearance upon the upper surface.

A furnace upon the above construction, if properly attended to, will refine 3½ to 4 tons, in twelve hours, and consume 15 to 18 bushels of mineral coal to each ton, two bushels of the char of wood, and 22 cwt. of pig metal to each ton of refined metal. The advantages of refining after the above method, will appear obvious to every discerning mind, as the metal is not brought into contact while in a state of fusion, with any part of the mineral coal.

From the intense heat of the furnace, the volatile parts of the coal are consumed, or pass along the roof of the furnace into the flue, while the surface of the metal is protected by the charcoal and the scoria, which in all cases keep uppermost without incorporating with the metal. Refining after the above way will be of great advantage to forges which bloom by means of charcoal, as it will greatly facilitate the procedure and lessen the quantity of charcoal used. The iron made as above is quite malleable, close in texture, and fibrous. One great acquisition is, that said refining furnace requires no machinery attached to it, and may be erected out of the way of all other buildings. THOMAS C. LEWIS.

ENGLISH PATENTS.

To JOSEPH D'ARCY, *Esq. executor of* CHARLES BRODERIP, *for certain improvements in the construction of Steam Engines.* Dated November 29th, 1828.

THESE improvements the patentee divides into three sections:—the first consists of an arrangement of parts, added to the cylinder of the steam engine, by which the beam, side rods, parallel motion, &c. are rendered unnecessary. In this method the piston rod is attached by a moveable joint, or ball and socket, to the piston, and the upper part is connected with a crank, which conveys motion, as required, to other machinery. The piston rod, in its passage upwards, passes through a jointed stuffing box, which slides horizontally along the top of the cylinder, in reverse directions, alternately, according to the strokes of the piston; by this means the piston rod will oscillate, and produce rotary motion, without the assistance of the usual apparatus employed for that purpose.

Another method is described by Mr. D'Arcy for effecting this object, in which he does away with the sliding stuffing box. In this instance the rod is also attached to the piston by a hinged joint; but a metal chamber or trough, sufficiently large to admit of the angular oscillation of the rod encompasses it, and being attached to the piston, it works perpendicularly through an aperture correctly formed in the covering of the cylinder, and well packed to prevent the escape of steam. Of these two methods, the first described is pointed out as being the most useful.

The second section of the invention is what the specifier terms

"a compound connecting frame;" but we are at a loss to discover what novel feature there can be in attaching three cranks to a straight frame of metal, which are evidently the whole of the component parts of this compound connecting frame. It is stated, that it may be adapted with advantage to an engine formed on the principle above described, which, by superseding so much of the usual gear, will be found particularly suited to land and water carriage, from its occupying much less than the usual space.

When it is desirable to place the engine very low down in a vessel, the power can be communicated to the paddles in their ordinary situation by using the connecting frame above mentioned, one of the cranks being attached to the shaft of a spur wheel communicating with the piston; the second, to a part of the vessel to serve as a guide; and the third, to the shaft of the paddle wheel.

The third section, after a lengthy description of a valve, to which no claim is laid, is described as being for the economizing of the caloric employed in the generating of steam, by causing the smoke and heated air proceeding from the furnace, to pass in a horizontal direction through a "steam receiving vessel," and subsequently through a vertical chimney. The valve before alluded to, (which, not being a part of the invention, we refrain from particularizing,) is directed to be placed in the steam pipe between the boiler and the steam receiving vessel, which latter is represented in the drawings of the specification as being a square metal box, divided by a vertical partition; and the patentee lays claim to the operation of shutting off the steam for a stipulated period, as necessity may require, from the boiler to the receiving vessel; but not as regards any other situation. [*Rep. Pat. Inven.*

To BENJAMIN GOULSON, *Surgeon, for certain improvements in the manufacture of Farina and Sugar from Vegetable productions.* Dated December 14, 1829.

THIS patent is stated to be for two distinct processes: the one, for converting certain vegetable productions into farina or flour; the other, for manufacturing the same into saccharine matter or sugar, and are described as follows:—

The roots or vegetable productions to be employed, are dahlia, carrots, turnips, beet, mangel-wurzel, and potatoes. These being well stripped of their skin, or washed, are steeped, either whole, or cut in slices, in pure water and acid, in the proportion of two pounds of acid to one hundred pounds of roots for the dahlia, and increasing the quantity of the acid for the remaining roots, in the rotation they are mentioned, up to ten pounds for potatoes. Any acid substance or acid salt will answer the purpose, but that preferred is sulphuric acid. When sufficiently acted upon by the liquor, the roots will become white and soft: the former is then to be run off, and the latter, after being well washed in pure water to deprive them of the

acid, are directed to be dried in the sun, or in stoves, and then to be ground: farina, or flour, will thus be produced, which may be used in lieu of wheaten flour for making bread.

In the second process, the farina obtained by the above method, is directed to be boiled in dilute sulphuric acid, in the proportion of two pounds of acid to one hundred pounds of farina, and saccharine matter or sugar will by this means be formed, which is clarified in the usual way. The sugar can be also obtained from the roots before being manufactured into farina, by subjecting them at the temperature of the atmosphere to the action of ten pounds of acid to one hundred pounds of roots. [*Ib.*

To THOMAS COBB, *for certain improvements in the manufacture of Paper intended to be applied to the covering of Walls or the hanging of Rooms, and in the Apparatus for effecting the same.* Dated September 15, 1829.

THIS patent embraces several objects relative to the manufacture of paper for hanging rooms.

The first described is a method of manufacturing tinted paper by embossing during the process of making, which is effected by passing the pulp between rollers or plates, one of which, at least, is engraved with any suitable device: the colour is mixed with the pulp previously to its being rolled, and the paper is consequently but of one hue.

The second process is for embossing the paper after it has been made, in which plates and rollers, as in the former instance, are also employed, but with this difference, that one or more of them are directed to be heated, by which it will be made to resemble silks and other substances.

The third is for uniting two pieces of paper together, by means of an apparatus that shall presently be described, for the purpose of giving it a more solid appearance, and also for increasing its durability when pasted against the walls. The sheets or lengths of paper may be either of the same colour, or the one white and the other coloured. The upper or outside sheet may be embossed by either of the means described, or the two may be embossed, after their being joined together, as may be found most convenient.

The fourth part of the invention is for uniting paper with pieces of silk, cotton, or other suitable substance, by which, it is stated, that an appearance of much greater than their actual value will be imparted to the latter. The silks or other substances are coated on one side with any glutinous matter, and being placed in their proper situations on the paper, the whole is passed through the rollers as in the former instance. It is recommended to cause the paper to be twilled, by passing it previously through rollers with grooves formed round their circumference, by which means, it is stated, that the paper will more readily receive the stamp of the embossing roller, and consequently give a sharper appearance to the silk.

The fifth and last object of the patent, is, for the machine before noticed for pasting together the sheets or lengths of paper. In this machine, the white paper to form the under side being wound round a roller properly weighted, to prevent its unrolling too quickly, passes upwards through two rollers covered with plush, one of which may be also converted into a rotary brush; this latter revolves in a box of paste, and coming in contact with the paper, covers it evenly with a coating of the paste. The paper then proceeds upwards till it arrives at a large drum or winding roller, where it meets the other paper on which it is to be pasted, and which is conveyed from the opposite side of the machine by means of guiding rollers; the whole being properly weighted, it is kept distended, and presses evenly with the pasted paper on the drum, on which it is wound to any length required.

In the final clause of the specification, the patentee declares, that he does not claim as his invention, the embossing of paper in general, but only as regards that employed for the hanging of rooms; he also states, that he does not confine himself to the mode described of pasting together sheets of paper, but that the same may be effected by any known method. [*Ib.*

To JAMES STEWART, *Piano Forte Maker, for his having invented certain improvements on Piano Fortes, and in the mode of stringing the same.* Enrolled, September, 1827.

THERE are three features of improvement proposed under this patent; the two first, consist in certain novelties in the construction and adoption of the dampers of double action grand piano fortes; the last is in the manner of attaching the strings to their pins, on all descriptions of piano fortes.

In the first place it is proposed, instead of bringing the damper wire immediately over the string which is to be acted upon, to place it two semitones, or one whole note off. As for instance, if the string to be acted upon is F, then place the wire damper between the string of G and G sharp, and so of the damper wires of all the other strings. The wires of these dampers are to be placed further back in the instrument than usual, in order to leave room for the introduction of a stopper, to prevent the recoil of the hammer after the note has been struck.

The second improvement is taking off the weight of the dampers, to render the touch of the instrument delicate, which is effected by partially raising the damper lever, and only allowing a part of it to bear upon the key.

Third, it is proposed, instead of forming a loop at the end of the string, for the purpose of attaching it to the hitch pin, to fix a very strong hitch pin, and to pass the string round it, bringing the end of the string back again to another tightening pin, and so causing one string to form two unison cords. It is stated that the friction of

the string, on the hitch pin, will be sufficient to hold it, and to allow of the string on each side, constituting two cords to be tuned separately. [*London Journal.*

To JOSEPH JONES, *Gentleman, for his invention of an improvement in certain parts of the process of Smelting, or obtaining Metallic Copper, from Copper Ore.* Enrolled, January, 1824.

THIS improvement is designed to assist the fusion of the metal contained in copper ore, and comes into operation after the ore has been brought into that state called regulus, or coarse metal.

Regulus, the patentee considers, contains sulphuret of copper, with sulphuret of iron, and in order to cause the copper to run more readily, he proposes to mix the regulus with a portion of copper ore that is free from sulphur; which, if not pure in its natural state, must be rendered so by calcination. The pure metal acts as a flux to the copper ore, and the iron then flows on the top, which may be taken off by skimming, or drawn away at the tap hole.

The quantity of copper ore required, will depend upon the state of the regulus, which will be readily found, and this process being repeated several times, will considerably expedite the operation of smelting. [*Ib.*

To WILLIAM GRISENTHWAITE, *Esq. for a new process of making Sulphate of Magnesia, commonly called Epsom Salts.* Enrolled, February, 1829.

THIS new process by which Epsom salts are to be produced, is by mixing together magnesia, sulphate of lime, or plaster of Paris, with carbonic acid and water, which will form a sulphate of magnesia.

The magnesia is to be obtained either by precipitation from sea water, or by the common earthy precipitations, or from the magnesian lime stone. The same modes of evaporation and crystallization, are to be employed, as are usually practiced by chemists.

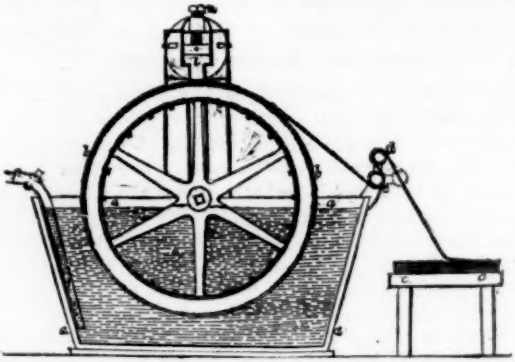
The patentee claims to be the first who has used sulphate of lime, and carbonic acid, for the production of the above salt. [*Ib.*

To HENRY HIRST, *Clothier, for his having invented certain improvements in manufacturing Woollen Cloth.* Enrolled, Aug. 1830.

MY improvements in manufacturing woollen cloths apply to that part of the process of finishing cloth, where a permanent lustre is given to the face of the cloths, usually by a process called roll boiling, that is, stewing the cloth when tightly wound upon a roller in a vessel of hot water or steam.

As there are many disadvantages attendant upon the operation of roll boiling, such as injuring the cloths by overheating them, which

weakens the fibre of the wool, and also changes some colours. I propose to substitute in place of it, a particular mode of acting upon the cloths, by occasional or intermitted immersion in hot water, and also in cold water, which operations may be performed either with or without pressure upon the cloth, as circumstances may require.



The apparatus which I propose to employ for carrying on my improved process, is shown in the accompanying drawing, which is a section taken transversely through the middle of the machine; *a*, *a*, *a*, is a vessel or tank, made of iron or wood, or any other suitable material; I prefer it to be sloping at the back and front, and perpendicular at the ends. This tank must be sufficiently large to admit half the diameter of the cylinder or drum, *b*, *b*, to be immersed in it, which drum I propose to make about four feet diameter, and about six feet long, or something more than the width of the piece of cloth intended to be operated upon. This cylinder or drum, *b*, *b*, I construct by combining segments of wood cut radially on their edges, which I secure by screw bolts to the rims of the iron wheels, having arms with an axle passing through the middle.

The cylinder or drum being thus formed, and rendered smooth, on its periphery, and mounted upon its axle in the tank, I now wind the piece of cloth upon it as tightly as possible, which I do by placing the cloth in a heap upon a stool, as at *c*, *c*; and having passed its end over and between the tension rollers, *d*, *e*, as shown, and then secured it to the drum, I draw the cloth progressively from the heap, between the tension rollers, which are confined by a pall and ratchet, or otherwise, on to the periphery of the drum, by causing the drum to revolve upon its axis, until the whole piece of cloth is tightly wound upon the drum; when I bind it round with canvass, or other wrappers, to keep it secure.

If the tank has not been previously charged with clean and pure water, I now fill it nearly to the brim, as shown in the drawing, and then opening the stop cock of the pipe, *f*, which leads from a boiler, I allow steam to blow through the pipe, and discharge itself at the

lower end, by which means I raise the temperature of the water in the tank, to about 170 deg. (Fahrenheit.)

Before the temperature of the water has got up, I put the drum in slow rotary motion, in order that the cloth may be uniformly heated throughout, that is, I cause the drum to turn, at the rate of about one rotation per minute, and in this manner I continue operating upon the cloth by immersing it in the hot water, and then passing it through the cold air in succession, for the space of about eight hours, which gives the cloth a smooth soft face, the texture not being rendered harsh, or otherwise injured, as is frequently the case by roll boiling.

After operating upon the cloth in the way described, by passing it through hot water, for the space of time required, the hot water is to be withdrawn by a cock at the bottom, or otherwise, and cold water introduced into the tank in its stead: in which cold water, the cloth is to be continued turning in the manner above described, for the space of twenty-four hours, which will perfectly fix the lustre that the face of the cloth has acquired, by its immersion in the hot water, and leave the pile or nap to the touch, in a soft silky state.

In the cold water operation, I sometimes employ a heavy pressing roller, *l*, which being mounted in slots in the frame or standard, revolves with the large drum, rolling over the back of the cloth as it goes round. This roller may be made to act upon the cloth, with any required pressure, by depressing the screws, *m*, *m*, or by the employment of weighted levers, if that should be thought necessary.

[*Ib.*

To E. W. RUDDER *and* R. MARTINEAU, *Cock-founders, for certain improvements in Cocks for draining of Liquids. August 20th,* 1830.

THE plan proposed to be adopted by these patentees, is, to manufacture liquor cocks out of sheet brass, or other suitable material, by stamping a piece of brass of an appropriate size, by a powerful press and suitable dies, into the form required to constitute the exterior casing, and by a similar process to form the interior of the cock. These pieces are then to be soldered together, with the seam of the one piece on the side opposite to the seam of the other.

The plug is also formed of two pieces of sheet brass stamped into form and soldered together, and also to a top piece which is cast solid. The hollow cavities above and below the liquid way through the plug, are to be filled up with solder or lead, according to the purpose for which the cock is intended.

It is to be regretted that the patentees have not pointed out, in their specification, the advantages of this new method of manufacturing cocks, for the benefits seem far from being obvious, and we fear but few will be able to discover them.

[*Register of Arts.*

To C. Random, Baron de Berenger, *for improvements in Fire-arms, and in certain other weapons of defence. August*, 1830.

The improvements in fire-arms here contemplated, are of two kinds: first, the lock is rendered more secure against accidental discharges; and, secondly, the percussion powder, or priming and charge, are better protected from wet by rain, or accidental immersion in water. The security against accidental discharges is obtained by interposing between the hammer and the touch-hole, a piece of metal to receive the blow in case of the tricker being moved. This guard, which turns back on an arm, can only be removed by drawing back a sliding plate placed under the stock, immediately before the tricker guard; and this sliding plate is drawn back by the left hand when pressing the fowling-piece against the shoulder, in the act of firing, so that no discharge can take place unless the piece is pressed against the shoulder at the same instant that the tricker is drawn. Another modification of this protecting apparatus is described to consist of a pin in connexion with the sliding plate, situated as before, passing into the tricker, and preventing it from moving till the sliding piece is drawn back, as in the other case; and, to render both these plans still more secure, the sliding plate is fixed by a small screw, which can only be released by a key similar to a watch key. This may be useful, occasionally, when a loaded gun is put aside.

To protect the percussion powder, priming, charge, &c. from the injury of rain, the patentee proposes to have the lock entirely within the stock, and an opening, which serves to introduce the percussion caps, has a cover which fits air tight upon it. The touch-hole in this case proceeds in a sloping direction through the breech to the middle of the concave surface of the front of the breech. A vent hole is opened by the act of firing, which allows the escape of the smoke arising from the firing of the priming.

Baron de Berenger's improvements in other defensive weapons, consist in a method of better securing bayonets on the muzzles of muskets, than that generally adopted, and a method of regulating the weight of a sword to the strength of the man using it. When bayonets are made to fit tightly on the muzzle of muskets, they are difficult to fix and unfix, and when they are made to fit loosely, they are likely to be accidentally unfixed when in use, or a horseman can sometimes dexterously unfix them with his sabre. To remedy these defects, the Baron proposes to make the bayonet pass over a projecting sight on the musket, in the usual way; but, instead of the notch for the projection turning twice at right angles, he only turns it once, passing it on by a longitudinal slit of the whole length intended, and then turning it in a transverse slit about a quarter of a revolution. Now, to prevent the bayonet from being turned round and accidentally detached, the ramrod passes into a projecting eye in the bayonet. In order to effect this, the ramrod is to be withdrawn about half an inch, when an opening in the side of the eye passes over the rod; and when it is again returned, a thicker part of

the rod fits into the eye, and prevents the bayonet from being turned till the rod is again withdrawn half an inch. This is really a very simple and secure method of locking the bayonet to the musket.

The other improvement, which applies to the broad or cutting kind of swords, and not to the small or stabbing sword, consists simply of a piece of metal secured upon the back of the sword by screws, and this can be removed at pleasure, nearer to, or farther from, the point to regulate the weight, and, consequently, the momentum of the sword to correspond with the strength of the man using it; for, as his strength varies by exercise, or otherwise, he can vary the momentum of his weapon. [*Ib.*

To SIMON THOMPSON, *Mariner's Compass Maker, for certain improvements in Piano Fortes. August* 26, 1830.

THE improvements contemplated by this patentee apply to the kind of instruments which have been distinguished by the appellation of cabinet piano fortes, and the object is to obviate the necessity for any part of the casing rising above the locking board, so that the top of the instrument is made flat like a table, and there is no silk front before the performer to deaden the voice in case of accompaniment. This object is effected by lowering the string frame till its upper surface coincides with the top of the locking board, and making the keys-bent levers turning twice at right angles between the fulcrum on which they move, and the extremities which act upon the hammers. On the inner ends of each key, rests an upright guide, wire or slight rod, and to this are attached various projecting pieces which actuate the hammers, the dampers, &c. much in the usual manner, so that this improvement, which is a very important one, is obtained without in the smallest degree altering the other parts of the instrument. [*Ib.*

To P. C. DE LA GARDE, *for certain improvements in apparatus for Fidding and Unfidding Masts, and in Masting and Rigging Vessels. August* 27, 1830.

THE old method of fixing and unfixing top and top-gallant masts, is attended with considerable inconvenience and insecurity, and hence have been proposed at different times various plans for facilitating the operation. For several of these, patents have been obtained; we do not, however, recollect any of the plans which are more likely to come into general use than the one before us, as all the operations connected with it are such as seamen are in the constant habit of performing. The fid, which supports the upper mast, consists of two wedges or keys passing from opposite sides over the trestle-trees through a slit in the mast. The wedges are placed with the thick end of the one over the thin end of the other, that the

seat on which the mast rests may be horizontal; and they are drawn into their places by tackles hooked to their smaller ends, at the same time they are sent home by the blows of a mallet applied to their thick ends. When the wedges are brought home, they are secured in their places by locking pieces connecting their ends. The operation of unfidding is performed by changing the tackles from the hooks in the small ends, to those in the large ends of the wedges, and drawing them back, the locking pieces being at the same time disengaged. All these operations are greatly facilitated by a series of anti-friction rollers placed between, as well as above and below, these wedge shaped pieces constituting the fid.

The patentee next describes his method of masting to consist of a kind of iron frame of a rectangular form, with diagonal stays fixed with iron straps to each side of the lower mast near its top. To these iron frames the shrouds are to be hooked instead of being attached to the mast in the usual way, by means of fastenings, which project on every side, and which, therefore, keep the upper mast so far from the lower as to render the fidding both clumsy and insecure.

An improvement in fastening the main sheet and other sails is next described. This consists in placing an iron rod to extend from the fore part angularly across the vessel, to the starboard or larboard side, according as the vessel is upon the starboard or larboard tack. Upon this rod is placed a traversing pulley, which is used for tightening the sail, and the advantage of this arrangement, is, that the pulley can be brought opposite the sail, or rather the end of the yard, in whatever direction it may be placed. [*Ib.*

To JOHN SURMAN, *Lieutenant and Riding-master, in the Tenth Hussars, for improvements in Bits for Horses, and other animals. August* 28, 1830.

THE improvements contemplated by this patentee, are of two kinds—the first, having reference to the form of the bit; and the second, to its connexion with the frame of the bridle, or rein levers. With respect to the first, it would appear that the lieutenant has not yet ascertained which is the best form to be adopted, for he describes several. One plan is to introduce a circular bend in its middle, (thus —⌒—); another, with an elliptical opening in its middle, (thus —○—); a third, with the middle spread out into three branches; and a fourth, with it spread out into four. These are described without any instructions as to the circumstances under which any one, or all of them are to be applied. The first form is certainly not new, and the third and fourth are far from being good, as they will cause a constant pressure on the tongue of the animal to which they may be applied. The improvement in the attachment of the bits consists in permitting the bit, of whichever form, to rotate in the side frames with which it is connected; and this rotation is obtained either by making the bits hollow, and passing a fixed axis through them, or else converting their ends into pivots to turn in the

frames, with collars either screwed or rivetted on their ends, to prevent their slipping out. The rein levers, which are made hollow to a certain extent, are connected to the bridle frame by means of spiral springs, that they may, on the application of force, deviate a little from the rectangular position, and rest upon a projecting circular shoulder. [*Ib.*

FRANKLIN INSTITUTE.

Quarterly Meeting.

The twenty-eighth quarterly, or seventh annual meeting of the Institute, was held at their Hall, on Thursday, January 22, 1831.

James Ronaldson, president, in the chair.

Mr. Samuel J. Robbins, was appointed recording secretary, pro tem.

The minutes of the last quarterly meeting, and also of the meeting held this day, at 3 o'clock, to appoint the tellers, and to open the poll of the election of officers and managers of the Institute, for the ensuing year, were read and approved.

The annual report of the Board of Managers was read and accepted, when, on motion, it was referred to the committee on publications, with instructions to publish such parts as they may deem expedient.

The annual report of the Treasurer was read and approved.

The tellers appointed to receive the votes of the members for the officers and managers, made their report, when the president declared the following gentlemen duly elected officers and managers for the ensuing year.

James Ronaldson, *President.*
Isaiah Lukens, Thomas Fletcher, } *Vice Presidents.*
James H. Bulkley, *Recording Secretary.*
Isaac Hays, M. D. *Corresponding Secretary.*
Frederick Fraley, *Treasurer.*

Managers.

Samuel V. Merrick,	Charles H. White,
Abraham Miller,	Thomas Scattergood,
William H. Keating,	Thomas Loud,
Adam Ramage,	Benjamin Reeves,
Isaac B. Garrigues,	Thomas U. Walter,
Rufus Tyler,	Alexander D. Bache,
John Struthers,	Alexander Ferguson,
John O'Neill,	Joshua G. Harker,
M. W. Baldwin,	John Agnew,
Joseph H. Schreiner,	Charles Toppan,
Samuel J. Robbins,	Mark Richards,
Mordecai D. Lewis,	John Wiegand.

Adjourned.

James Ronaldson. *President.*

S. J. Robbins, *Recording Secretary, pro tem.*

Seventh Annual Report of the Board of Managers of the Franklin Institute.

To the Franklin Institute of the state of Pennsylvania, for the Promotion of the Mechanic Arts, the Board of Managers respectfully present their seventh annual report.

The return of our anniversary meeting calls upon the Board to present to the Institute a general view of the condition of the institution, of the objects which have been accomplished or promoted during the past year, and of those which will require the active exertions of the new Board.

It is pleasing to add that our efforts have met with a due share of success.

Education was the first object of the Institute, as they considered it the corner stone of the edifice which they wished to raise to the promotion of the mechanic arts. With this view it attracted their earliest attention, as well as the uninterrupted solicitude of each succeeding Board; and as far as we have been concerned, it is hoped that every opportunity has been improved to consolidate the excellent system originally adopted. The lectures on chemistry and natural philosophy, with its applications to mechanics, have been productive of that additional degree of usefulness which was to be expected from the increased experience of able professors. These lectures are to be considered as the ground work of instruction in an institution of the nature of ours. Motives of prudence imperatively required, in the origin of the society, that our plans should be limited, in order to be successful; but it is a question which presents itself, in our more mature condition, whether further extension may not be given to our system of education, without endangering its permanency or its usefulness. It is probable that such might advantageously be attempted, and it is a subject to which we would earnestly invite the attention of our successors. Much good has undoubtedly been done; but this reflection, however gratifying, would be productive of little advantage, if it were not followed up by the inquiry, how far this good may be extended? It is not difficult to point out the branches which require attention; the only embarrassment is in the selection of those of most urgency. In this enumeration of *desiderata* in general education, we propose to avoid every thing like a competition with other institutions. Our city is not yet sufficiently populous to require, or perhaps even to justify, a competition on many branches of science, but there are some which naturally belong to our institution, and in which the public confidently expect us to take a lead. Foremost among these we would suggest the subject of machinery, or practical mechanics, as contradistinguished from the theory of mechanics, usually taught in lectures on natural philosophy. Experience clearly shows that the subject is too vast to be embraced in one course; and while it is evident that the rudiments of the science of mechanics are indispensable, it is equally clear that a practical acquaintance with the details of the construction of machines, is an object not less to be desired. Nor is it to

be believed that this point can be satisfactorily obtained by neglecting the other branches of natural philosophy, to concentrate our attention exclusively upon mechanics: for who that was not acquainted with the properties of heat, or with the laws of pneumatics, could pretend to understand the operation of the steam engine, or even of the common pump? &c. and to take an instance from one of the noblest and most recent applications of science to the useful arts, who can pretend to judge of, or justly to appreciate a locomotive engine, that has not first mastered the leading principles of natural philosophy, and then made himself familiar with the construction of machinery? It appears to us that this subject is one which the Institute is now able to undertake, and we would earnestly recommend it to the early attention of our successors. Again, at a moment when the greatest interest has been manifested by this city in the promotion of mining, when much capital is embarked in the search after favourable deposits of mineral wealth, or in the extraction of it from the earth, is it not a subject of regret that there should not be at this moment, in this city, a public course of lectures on mineralogy, and that the able and enterprising individuals, who have manifested an anxiety to lecture on geology, should have met with no cheering on the part of the community to which they were willing to devote their gratuitous services? Such lectures, we are aware, cannot be duly encouraged, unless brought before the public under the patronage of institutions resting upon an independent foundation; but it is from these that men of science have a right to expect assistance; it is to these that our liberal and patriotic citizens look to direct them in their anxiety for the promotion of all that can contribute to the welfare of our community. Other branches, perhaps equally important, naturally present themselves; but enough has been said to show that the great field which the Institute had appropriated to itself, has as yet been but very partially cultivated.

Next to our lectures, and closely connected with them, are our public schools; upon this subject the Board have nothing to add to the reports of their predecessors. The same solicitude for their prosperity was felt and displayed. The same gratifying popularity attended the drawing school; the same failure was again experienced in the attempt to enlist the attention of the public in favour of the mathematical school. Again baffled in their wishes, if not in their hopes of success in the latter, the present Board deem it their duty to state that their opinion of its usefulness remains unimpaired; and while they believe that the present plan has been sufficiently persevered in to justify a conclusion that, on its present foundation, it is not likely to receive adequate encouragement from the community, they would earnestly invite the attention of their successors to this object, that they may consider whether some more popular plan may not be devised, or whether the project is to be abandoned as wholly hopeless. The high school, of which the Institute may proudly boast as an offspring of theirs, continues to flourish and to be useful.

The Board have much pleasure in stating that the experiments upon water wheels, which were projected and prepared in 1829,

have, during the last year, been continued with unremitting zeal and attention by a committee of the Institute. The experiments are now completed; the report is in preparation; and, as it may be expected to be published shortly, the Board will not anticipate at present the information which it is intended to embrace. They will, however, state their conviction, that the results will be found highly interesting to science and the arts, whether in confirming certain theories hitherto resting upon doubtful observations, or in correcting the errors resulting from imperfect and unsatisfactory experiments. The majority of the Board feel themselves perfectly justified in expressing their opinion on this subject, without the fear of rendering themselves obnoxious to the charge of arrogance, as they deem it a duty to add, that the whole credit of it is due to the committee of the Institute to which the investigation was entrusted.

Another important inquiry was commenced and prosecuted by the Institute, during the present year. Its object is to examine into the causes of the frequent explosions of steam boat boilers, and into the remedies which may be proposed to obviate them. This inquiry, which has been continued for several months, has led to the accumulation of much information, collected from various sources, and which the committee, to whom the investigation was entrusted, hope to be able soon to embody into a preliminary report. It was at first believed that, however valuable a series of experiments on this subject would prove to be, it was not in the power of the Institute to undertake it at this time; as it would involve an expenditure too great for the limited funds of our association, and which we did not feel ourselves at liberty to expect from the friends of the Institute, who had so recently, and so liberally, contributed to the experiments upon water wheels. It has, however, occurred in this case, as in all the preceding ones in which the Institute has found itself in pecuniary difficulty, that assistance would never be denied to disinterested and judicious efforts to promote the public good; a fund was placed at the disposal of the committee, which will enable them to extend their inquiries much further than had been originally contemplated. The apparatus for the experiments is now nearly prepared, and it is hoped that they will be soon commenced. If any thing could have added to the pleasure which the Board experienced at the receipt of this fund, it was the knowledge that the efforts of the Institute to promote the success of the mechanic arts, had met with the general approbation of our fellow citizens, as is manifest from the high source by which this proof of unsolicited liberality has been extended to them.

Another of the objects which may be considered as having received the particular attention of the Board, is, the extension of the facilities of the reading room and library. These had hitherto been postponed, from the impossibility of furnishing sufficient accommodations for them. By a fortunate concurrence of circumstances, the officers of the United States' courts were induced to propose that heir lease should be cancelled, under certain conditions, which were deemed sufficiently advantageous to the Institute, to justify us in the

acceptance of them. The rents from our building have, it is true, been partially reduced by this circumstance, but we consider the loss as fully compensated by the increased accommodations we enjoy. The Institute have now the use of the two lower stories of their building, with the exception of the front offices. A new spirit has been infused into the society. A handsome contribution of books, minerals, and money, was immediately raised among the members, and the reading room was opened, under its new organization, on the 23d of September last. The library now consists of upwards of 500 volumes, and is receiving daily accessions. In it are already to be found many valuable works on the mechanic arts; and it is the firm belief of the Board, that with a little attention on the part of our successors, it may soon acquire a value in this department of bibliography which no library in this city, and perhaps none in the country, now presents. In examining into the character of our libraries, it will be seen that among the many public ones in Philadelphia, (not less than 20 or 30 in number,) there is none that possesses any especial value as a technological one. While the city and Loganian libraries, by their extent, and by the rarity and value of their contents, are just subjects of pride to our citizens; while those of the American Philosophical Society and of the Academy of Natural Sciences contain vast treasures in science; while the libraries of the hospital and law society are rich in the departments which they were intended to promote; there is not in Philadelphia a single institution, in which the formation of a collection of books relating to the applications of science to the arts has been deemed worthy of special attention. In a city like ours, this is undoubtedly a great desideratum, and nowhere is it so proper that such a collection should be formed, as within the walls of this institution. With this object, we would beg to suggest that every means be taken to cultivate this department; though not to the exclusion of others, yet giving it a decided preference. It has been asked whether we intended to exclude donations of books not connected with science or the arts? Our answer is evident. By no means. It is desirable to create a taste for books among the members, and particularly the younger ones; who, from the want of opportunity, have been hitherto, perhaps, precluded from extensive reading. This taste we all know is gradually acquired. It must be cherished by giving them works that shall not fatigue their attention, and by affording them that variety which refreshes the mind and stimulates the intellectual as well as the physical appetite. But every opportunity should, we think, be taken to exchange duplicate works, or such as may be deemed irrelevant to the purposes of the Institute for valuable works on the arts, whenever such can be obtained. In doing so, it is believed that we in no manner interfere with the intentions of the donors, who may in all cases be safely presumed to have desired to manifest, by their liberality, their interest in the welfare of the Institution. In effecting exchanges of books, the Board have, hitherto, adopted the rule of carrying those obtained in exchange, to the credit of the donors of such as were parted with. This plan, it is believed, must satisfy all, that the Institute

have no other object than to increase the value of the present. Still the Institute would gladly accept of donations that may be made under a condition that such books shall not be exchanged; and in such cases the conditions imposed by the donors shall be religiously adhered to.

Although the reading room has been opened but a few months, yet its benefits have already been felt; connected with the monthly meetings for scientific discussions, it is seen to increase the interest of the members in the institution: and as the benefits are more extensively shared, they will add to the desire on the part of our fellow citizens, to enlist themselves among the members of the Institute.

This will produce its effect upon our cabinets of models and minerals. The former, though yet very limited, exhibits some very interesting specimens of the ingenuity of our artists.

We must not omit to advert to the exhibition of domestic manufactures held under the auspices of the Institute, in September last; a prouder display of the evidences of American ingenuity and enterprise has, we believe, never been made either in this or in any other city; but on this point we deem it unnecessary to enlarge, as a detailed account of it has already been for some time before the public. It is a point on which this Board has not yet come to a decision, whether the exhibitions had better be repeated annually, or only biennially. Should the new Board determine to hold one next fall, no time must be lost in preparing for it; a plan is under consideration which will, it is believed, contribute much to enhance the brilliancy and usefulness of these interesting exhibitions.

The Board advert also with pleasure to the condition of the Journal, because it is believed to have materially improved in the last year. If not productive in a pecuniary point of view, it at least tends to enhance the character and extend the reputation of our association. It assumes every year a more popular form, and appears to excite more interest in the community at large. This the Board believe to be in a measure due to the excellent plan of publishing the list of patents, with remarks upon all of them. The occasional introduction of the specifications at large is also of primary interest; and we have only to lament that the restricted condition of our subscription list precludes the insertion of a greater number of such as require plates for their elucidation. Hitherto the state of our funds has been such as to prevent our appropriating an adequate compensation to the Editor. Were the Journal such as to allow us to secure the exclusive services of our present Editor, or to associate some other person with him, and to afford a stated remuneration to all contributors, such as is practised with other literary and scientific Journals, there is no doubt that the value of our publication would be greatly enhanced. For this we must throw ourselves upon the enlightened liberality of the public. It behooves every member of the Institute to be zealous in procuring additional subscribers to the Journal.

We have cause to regret also, that more active measures have not been taken to increase the list of members of the Institute. Our numbers appear to have continued stationary, while the demands

upon our funds have greatly increased since the origin of the society. This arises from the great extension given to its sphere of usefulness. It is estimated that the number of annual contributors does not much exceed 600; while there can be no doubt that a society of the nature of ours ought, in such a city as Philadelphia, to command at least 2000. When we look to the extent of our system of education—to the liberality with which it is made to include all the younger individuals of a member's family—to the privileges of the library and reading room, which in other institutions cost more than twice as much as the whole amount of our annual contribution—to the advantages which members have in visiting the exhibitions—and when we recollect that all this is obtained by the small annual payment of three dollars, free from all other charges, we have reason indeed to be surprised that our list of members should not have swelled to a much greater number than that above stated. At the close of their services, the Board deem it their duty to urge it upon the members of the Institute, both collectively and individually, to exert themselves to procure new contributors. If each of them were to make it a point to obtain at least one new member, (a matter of little difficulty,) the benefits which would accrue to all would be inconceivably great, as we should then triumph over the principal impediment that has hitherto retarded our progress.

The Treasurer's report hereto annexed, exhibits a balance of $918 73 in his hands, from which, however, must be deducted, the amount of orders drawn, $296 66, which will reduce that at the disposal of the next Board, to $622 07.

The following gentlemen have, within the last year, become life members, viz.

Henry Seybert,	Joseph Warner,
G. M. Elkinton,	Charles Wetherill,
John Struthers,	William Schively,
John C. Lowber,	I. S. Barnard,
Francis Kearny,	I. P. Morris,
Alexander Ferguson,	S. R. Simmons.

Monthly Meeting.

The stated monthly meeting of the Institute was held at their Hall on Thursday evening, December 23, 1830.

Mr. Thomas Fletcher, vice president, presiding.

Mr. George W. Phipps, recording secretary pro tem.

The minutes of the last meeting were read and approved.

The following donations were presented to the Institute, viz.

By Messrs. Carey and Lea.

The Chemistry of the Arts, being a Practical Display of the Arts and Manufactures which depend on Chemical Principles, on the basis of Gray's Operative Chemist.

Arnott's Elements of Physics, Vol. 2nd, Part 1st.

By M. Carey, Esq.

Rapin's History of England, 15 Vols.

Twenty Pamphlets on various subjects.

By Mr. Isaac P. Morris.

Ferguson's Lectures on various subjects.

Experimental Researches concerning the Philosophy of Permanent Colours, by Edward Bancroft, No. 3.

Phillips' Elementary Introduction to the Knowledge of Mineralogy, by Professor Samuel L. Mitchell.

A Manual of Mineralogy, by Arthur Aikin.

The Eloquence of the British Senate, by William Hazlitt.

An Appeal from the Judgments of Great Britain respecting the United States, by Robert Walsh, Jr.

Roman Antiquities, or an Account of the Manners and Customs of the Romans, by Alexander Adams, LL. D.

By Mr. S. C. Atkinson.

The Casket, for 1830.

By Mr. George W. Phipps.

A Dictionary of Arts and Sciences, 4 *Vols.*

By Isaac Hays, M. D.

Ecole Centrale.

Biographical Sketch of Alexander Wilson.

Documents from the Navy Department, the Post Master General, and the Commissioners of the General Land Office, accompanying the President's Message to Congress.

By Mr. Thomas Harper.

An Address of the Managers of the Schuylkill Navigation Company.

By Mr. James Ronaldson.

A Review of Mr. Cambreling's Report from the Committee of Commerce.

By the Hon. William Marks, Senator.

Documents accompanying the President's Message.

By M. St. C. Clark, Esq. Secretary of the house of representatives of the United States, by resolution of the house.

Journal of the House of Representatives, from the 1*st to the* 13*th Congress, inclusive,* 9 *Vols.*

The Diplomatic Correspondencies of the American Revolution, edited by Jared Sparks, 8 *Vols.*

The corresponding secretary laid on the table the following works, received in exchange for the Journal of the Institute, viz.

The American Quarterly Review, for December.

The Magazine of Useful and Entertaining Knowledge, for November and December.

The Illinois Monthly Magazine, for December.

The Mechanics' Magazine, and Journal of Public Internal Improvements, for November.

Annales des Mines, Vol. 7, Parts 1 and 2.

Annales de l'Industrie et Bulletin de l'Ecole Centrale des Art et Manufactures.

Annales de Chimie et de Physique, for July.

Journal Universel des Sciences Médicales, for June.

Recueil Industriel, for August.

Bibliothéque Physico-economique, for September and October.

Bulletin de la Société d'Encouragement pour l'Industrie Nationale, for July.

A communication from Col. J. L. Sullivan, on the subject of Winans' Friction Rail-way Carriage, was read, and after being discussed, it was, on motion, referred to the committees on publication and on inventions.

The discussion of explosion of boilers of steam engines being called up as the order of the evening, Professor Alexander D. Bache read a letter received by him, giving a further account of the explosion on board the steam boat Caledonia, together with remarks on the subject by the writer.

Other communications on the same subject, were received and discussed, after which they were referred to the committee on explosions, and the subject continued to the next meeting.

THOMAS FLETCHER, *Vice President.*

GEORGE W. PHIPPS, *Recording Secretary, pro tem.*

TO THE FRANKLIN INSTITUTE.

Remarks on WINANS' *Rail-way Carriage. By* JOHN L. SULLIVAN, Civil Engineer.

SIR,—When I submitted to the Institute, in April, 1829, a description of the rail-way wagon, invented by Mr. Winans, depositing a model at your Hall, and soliciting a committee on this invention, I expected, of course, that its imperfections, as well as merits, would not escape their discernment. I considered the Franklin Institute as a tribunal of science, to which every inventor might bring the product of his ingenuity, and offer its *usefulness* to a fair and skilful investigation, in the hope, if not in the confidence, that a favourable opinion of it, by men competent to judge, might introduce it to the public under the *best* auspices; or, its defects being pointed out, be previously remedied. I was not, therefore, disappointed in the result of the report.

My attention had been drawn to this improvement as an instrument in the *public economy* of rail-roads. Experiments with models had given me quite as much confidence as its mechanical combinations warranted; and taking some small interest in its success, I felt that it was not only proper, but extremely desirable, that my own favourable judgment should be sustained, by the good opinion of perfectly disinterested parties.

When, therefore, the committee pointed out certain supposed liabilities to *peculiar* stress, and *unequal* wear, and in expressing the "wish to see a carriage on this construction of full size in operation," suspending their full approbation until this opportunity of mature judgment should arise, I perceived it would be incumbent on me, for the interest of the inventor, as well as for my own credit as a mechanician, to make a further communication when practice should

have tested the value of the machine, and due progress have been made towards its perfection; availing myself of the hints conveyed, with equal politeness and good will, in the report.

To do this, however, it was necessary to wait the slow progress of events; and now, though apparently tardy, I hope and presume a brief account of this invention, up to this time, will be acceptable to the Institute, not only as that of a new machine, but of an instrument concerned in the prosperity, possibly, of Pennsylvania, in the extensive rail-roads she is forming as part of the great line of commercial communication between her capital and the navigable waters of the west. The nature of all mechanical improvements very much depend upon the magnitude of the purpose to which they are applicable, and there are few greater than the cheap transportation of the materials of the internal commerce, together with the agricultural and mineral resources of this state.

In the combinations of mechanical principles, compound leverage in mills, for example, is well known; but I think it had not been usefully applied to carriages until that of Mr. Winans appeared, and with singular novelty and neatness in the mode of his subduing friction in wagon wheels.

It did not escape the notice of the committee, that the *occasional obliquity* of the main axle to the transverse line of bearing under the rim of the friction wheel, would cause the surfaces of it, and the rolling gudgeon of the main axle, to receive at such moments near the *end* of the latter, and the *edge* of the former, the whole weight due to that wheel; and they apprehend, therefore, that *these parts* would wear *most:* but did they not accidentally omit to state that the *ordinary* pressure and wear is *between* these points, and, therefore, if those parts wore down most at such times, still the surfaces must, *on the whole*, wear *equally?* so it seems to me.

Another inconvenience apprehended to be of consequence, was the *endwise* pressure of the axle against the friction wheel, making it operate with its axle as a bent lever to twist the side pieces of the frame out of place. But did not the committee lose sight of the fact, that on rail-roads there can be no considerable "swaying" of the load from side to side? that the moment there exist inequalities sufficient to produce this effect, there can be no *velocity?* that the road must be so out of order, or imperfectly made, as to fail of its purpose? that the two rails of the track must coincide in level? Indeed, so little precaution is required to be taken, that even on the temporary imperfect tracks at the Baltimore excavations, while other causes of injurious wear existed, this effect was not among them.

The accidental *injurious wear* above referred to, both explains the reason of another liability, to which the committee pointed, and in some measure supplies its *disproof.* They supposed the surface of the *rim* would, by the rolling at the gudgeon, not only wear away, but form into grooves, in one of which the rolling gudgeon of the main axle would at length make a permanent lodgment, and reduce the friction wheel to the condition of a common bearing box: it was not, however, adverted to, that before the rolling forward of the

gudgeon in the rim could stop, the friction at *its axle* must be a greater resistance than that produced at its rim. The almost impossibility of thus stopping, was shown in the instance of those first large wagons, put in operation; the friction wheels of these were, (in the absence of Mr. Winans,) cast of *soft* iron, in order to be more easily turned smooth and cylindrical; but they were *so soft*, that their surface crushed under the harder surface of the gudgeon, and wore away; but wore away *equally:* for their very roughness gave the gudgeon a stronger hold, and they would have continued to revolve till worn thin enough to break.

To remedy the defect of the *soft castings*, and this liability to wear as apprehended by the committee, Mr. Winans has now succeeded in casting the friction wheels, not only in very *hard* iron, but the interior of the rim perfectly cylindrical, thus attaining *economy*, *hardness* and *smoothness*. It is found that *chill castings*, in which steel gudgeons roll or rub, work as smoothly and durably as brass. The whole carriage *now* scarcely costs more than the common kind.

The rail-road being well built, the stress on the friction wheel rim must be perpendicular to its axle, (and liabilities to surge, if they exist, may be checked at the frame,) a further improvement on them has now been made. This is to enclose the friction wheel in an iron case, which at once sustains the ends of its axle, keeps off the dust, and serves as the depository of the oil. The case is circular, and is let into the *under* side of the timber, (now single,) far enough to bring the top of the inner surface of the friction wheel *level* with that of the timber. Arms here project from it, by which it is bolted on. In England, where iron is cheap, these arms prolonged and connected, form the sides of the frame. The inner side of the case has an aperture for the main axle gudgeon to enter and lodge under the rim of the friction wheel, and with room for some play. The friction wheel is cast so as to revolve *on* its axle, and not *with* it. The nave bearing, (five inches through,) is cast to a chill pin, which being removed, receives a *cast steel axle*, fixed firmly in its place by means of screw nuts at its ends. The oil being lodged in the case, the joints of which are tight, is taken up by the revolving rim of the friction wheel, and continually carried to its axle, and to the gudgeon of the main axle. All the surfaces that move upon each other are within these four cases, thus thoroughly oiled, yet without waste. Indeed, the same mode of oiling is now applied to the first method, with revolving axles. Both methods are approved at Baltimore. This manner of oiling, as well as the slowness of the movement at the rubbing axle, is very favourable to their use with the speed of locomotive engines.

Feeling assured that the candour of the committee will allow me to meet all their objections by such new facts as have arisen, as they can have no other aim than to guard and to serve the community, I ask leave briefly to notice the remaining one or two.

They thought that the rim of the friction wheel might not be *strong enough* for the stress outwards, from the centre, so as safely to hang the weight of the load by them, there being four on the ends of the

main axles, but that it would sustain the load better, if these rounded ends of the main axles were lodged on the *convex surface* of the friction wheel, then seeming to have the properties of the arch.

But may I not remind the committee that the purpose of the inventor was to avoid all *incidental*, and reduce by leverage the resistance of the *inevitable* friction? He tried the other, and thought the carriage thus more simple; and it is not really material whether the rim be one inch, or one and a quarter thick. *Not one has yet broken with even four tons load.* Besides, there is a peculiar advantage resulting from this lodgment, as I shall have occasion presently to show, in turning the curves of a rail-road.

In operation, the committee thought, too, that as the retarding force of gravity would be just as much against this wagon as against others, that it would, on the whole, be *more;* because the weight of the friction wheels would be superadded. I had, indeed, omitted to mention in my description, that the weight of the main wheels might be *at least* as much lessened, by a small diminution of their size, or otherwise, as lighter main wheels than usual will wear well with the friction apparatus. It is thus exemplified.

In practice at Baltimore, the four friction wheels with cases, weigh 100 lb. The large wheels, 700 lb. Their two axles, 236 lb. The average weight of several complete wagons, 1558 lb. One of the most complete Liverpool wagons tried in competition against one built there by Mr. Winans, both having three feet wheels, weighed 22 cwt. His 21 cwt. Besides, the objection of gravity would not apply, unless that of the friction wheels retarded the carriage more than their leverage helped it.

The committee justly observed that "nothing but actual experiment on a large scale, will fully develope the precise amount of the advantage of a machine of this nature, because it is not possible to foresee all the circumstances which will attend its construction and *use.*" This is true of its use, because its performance does not depend alone upon itself, but also on the smoothness and solidity of the road upon which it is to run. For this reason it would be doing the invention injustice to decide on its ultimate excellence by its performance under the unpropitious concomitants of a new and rough rail-road. Indeed it can hardly be expected that our rail-roads will soon be as perfect as they are made in England, where iron is cheap. A comparison of one wagon or engine with another, to be conclusive, ought to be made on the same road.

At Liverpool, the wagon of Mr. Winans was tried, as before mentioned, against one of the wagons of the rail-road company, each loaded to weigh with the carriage 80½ cwt. under the supervision of Mr. Charles B. Vignoles, one of the most eminent engineers in England. His report thereof was published in the Mechanics' Magazine, in February last. He states in that, and in a letter since printed, that he found the friction of the wagon of Mr. Winans, 2½ lb. to a ton, and of Mr. Stephenson's, 9¾ lb. to a ton: both with 3 feet wheels.

It is well known that the usual friction of the common rail-way

carriages is 11¾ lb. a ton, and Mr. Stephenson was mainly indebted for the difference, to a part of the improvement of Mr. Winans, *the outside bearing*, for the outside projection of the axle permitted of *more reduction* of size, than the necessary strength of the axle *between* the wheels will allow of. This was Mr. Winans' first improvement.

But perhaps there can be no better method of comparing the friction of rail-way wagons, than by the elevation of the inclined plane down which they will respectively run by the force of gravitation. In the published report of the survey and location of the Baltimore road, this was, as on other occasions, considered by the engineers to be for the common carriage a little more than 30 feet in a mile. But Mr. Vignoles states that he found the friction wheeled wagon would descend by the force of gravity alone, an inclined part of the rail-road of only 5 feet 10¾ inches in a mile.

A superiority of 5 to 1 in principle thus conclusively demonstrated in full size, comes very near the original performance of the model. The best kind of wagon may be diminished in useful effect by newness, roughness, curves and ascents in rail-roads; but its superiority in principle over other carriages will still be maintained, though the power should fail to effect as much as it could, were the road smooth, hard, and level.

It is manifest, therefore, that the superiority of that with friction wheels will be great on descending ground, as well as on *level* ground. And especially so in this country, where the location of our greatest rail-roads are likely to be up and down the vallies of our rivers, for it is well known that 4-5ths of the tonnage is outwards.

It is certainly interesting to the public to see this principle in the rail-way wagon, carried in practice as far as it will bear.

Opportunities are likely to occur on the rail-roads between our great cities, which will be remarkably level. It is demonstrable, perhaps, that it is better to make considerable circuits rather than to cross high ridges. *That number of feet elevation* in a *mile*, whereon gravity alone will give motion, has been considered equal to a mile in the expense of power. But though the rail-road from Philadelphia to Columbia rises in some places 27 feet in a mile, it will be, notwithstanding, an advantageous run for locomotive engines, and this wagon will enable them to do much more service than they otherwise could. Because wherever the descent is above 6 feet to a mile, the loaded wagons will accompany the engine with all the speed it could alone attain.

It was a gratifying testimonial in its favour, at Liverpool, that Mr. Ericsson insisted on having these wagons for *his loading*, when proving the efficiency of his locomotive, the celebrated *Novelty*. And he took them rough from the quarries and excavations as they were: for the rail-road company, after the *test*, had agreed for a dozen or two of them. It was thus that the *Novelty* carried 28 tons at the rate of 8 miles an hour, as stated and published by Mr. Vignoles. And I have understood that this convinced the engineer of

the company of their superiority; so too the circumstance of their use on the works under his care is a strong fact.

Indeed the weight of the testimonial given by Mr. Vignoles, is fully equal to that of *any other engineer*, and certainly is very conclusive. His investigations were made with a wagon of full size, in the presence of many witnesses. His report is of careful and repeated trials, and the result is given to the world on the responsibility of his high professional character. It amounts to a recommendation of this improvement to all the rail-road companies in England.

It would be here a fair inquiry on the part of the committee, why the Liverpool company does not employ this kind of wagon wholly. The true answer is, that they had formed an establishment, before this improvement appeared there, to build the common kind, considerably improved in workmanship and proportions, under their skilful chief engineer, who therefore reluctantly yielded to the conviction that compound leverage had a good effect in carriages. And could Mr. Winans have accepted the company's offer to remain, more of the friction wheeled wagons would have been already in use.

It remains to give an account of the progress of this invention in our own country. If not so decisive, it will not be without some satisfaction; and useful and correct information is now wanted by the public on this subject. The Baltimore rail-road, it is generally known, commences on the present borders of the city, 66 feet above tide, and is carried level 7 miles, through and over hills and vallies: and then ascends the rocky valley of the Petapsco, necessarily following the indentations of the hill, along the slope of which it is led by a winding line, the alternate curves of which are often on a radius, (it is said,) of no more, if so much, as 400 feet. In England the radius of rail-road curves is always much greater than this, having probably a better choice of ground. Their roads are nearly straight, and the wheels may be without objection wedged upon the axles.

This location, therefore, appears to have been thought to demand a kind of compromise in determining the size of the wagon wheels. The model, you may recollect, permits the main wheels to turn on the axles, occasionally a little, though in operation actually fixed by the pressure of load, and the comparatively less resistance to turning, at the axles of the secondary wheels. It *was* expected that on turning curves, this would be a convenient property, because there could be no sliding; but the difference in the length of the rails of the curve, be made up by just so much turning of the outer wheels on the main axles; it might be only a few inches.

But on a large scale Mr. Winans found, while in England, that he gained something upon *the resistance* by wedging the wheels fast: and on straight roads there was no objection to it. It then became of less consequence on *which side of the rail the flanch worked;* and he found that by putting them on the inside, as usual there, it permitted of a slight degree of cone in the rim, which by means of the faculty of adjustment in the axle to resistances, was favourable to steadiness in the progress of the carriage.

This probably suggested the idea of an increase of the cone near the flanch to favour the passage of the wagon around those *short curves:* because, on entering them with speed, the wagon would have centrifugal force enough to incline it most to the outer rail, when the effective diameter of the wheel, being increased by running on the cone, while the other wheels run on the lesser diameter of the flat of the rim, measured by equal revolutions the unequal lines of rail; and on taking the reversed curve, with the like effect; their present engineer, Mr. Knight, having calculated the exact degree of conical swell to produce these effects, on the curves of *this road.* On reaching a straight course, or the change of the curve, the vibratory or adjusting action of the main axles takes effect, and establishes the line of steadiness, when otherwise there would be *sliding*, and consequent wear of both the rail-way and the wheels.

The various considerations which entered into the subject, it appears, fixed the diameter of the main wheels at 30 inches. The friction wheels, inside measure, are 9 inches diameter.

The present unfinished state of the first section of the road, does not yet permit of ascertaining the full benefit of the principle, there being but one track; because the heavy loaded wagons are compelled to travel in accommodation to the passenger carriages, a part of the distance ten miles an hour, and five miles ascending 13 feet in a mile. At present, therefore, they do not attempt to carry more than eight tons to a horse. The passage carriages run with about 30 passengers to one horse, at 10 miles an hour, changing at half way.

But I intend, with your leave, to furnish for the Journal the further progress of practice, that the Institute and the public may have knowledge of the facts in this branch of rail-road economy, without the least reserve, wishing that only to be preferred which deserves preference.

Although the extent to which compound leverage might be carried, in rail-way wagons, is not at present determined by experience at Baltimore, still in another respect may be deduced from it, the very satisfactory result, that these carriages will run a long distance without any repairs. One of those for passengers was lately shown me at the rail-road, that had the last year and the present run loaded six thousand miles without requiring any expense upon it, and was said to be still in perfect order. And you may have seen in the Baltimore American, of the 6th inst., that one of those for heavy loads, which had run 1800 miles, was taken apart for examination, and its rubbing and rolling surfaces found in perfect order.

I do not, however, insist, from all that has been adduced, that the committee and Institute ought to feel perfectly satisfied that this improvement is of great consequence in rail-road economy. But will express the hope, that the day may not be remote, when they may see them here of *business dimensions*, and the principle carried as far as may then be found expedient.

Nor do I believe this a vain wish. There are in this state several routes where rail-roads might be beneficial to the public, and well

recompense proprietors. None are more obvious than from Harrisburg to Carlisle, and from the head of Schuylkill navigation to Sunbury, (spoken of in the papers of the day,) and from Philadelphia to Trenton, should one be made across New Jersey.

With acknowledgments to the committee for their attention to this subject, and to the Institute for the indulgence of so large a proportion of their time,

I remain, very respectfully,
your humble servant,
JOHN L. SULLIVAN,
Civil Engineer.

Philadelphia, December 17, 1830.

Postscript.—Since writing the preceding additional explanation, I have seen the article on Internal Improvement, in the American Quarterly Review, for December, on which, page 293, the subject of rail-roads is a topic, and wherein mention is made of this invention. "Winans, a citizen of New Jersey, has *proposed* a carriage with a new species of friction wheels; and Fleming, a European engineer domesticated among us, has contrived a means of substituting a motion of mere rolling for that of wheels. Both have succeeded completely in model, and in experiments upon the small scale, but practical men entertain doubts, which do not appear to be ill founded, whether either can be actually applied in practice."

This passage, (I have no doubt the Editor himself will admit,) is objectionable, not only in coupling the two inventions, so essentially different, but in speaking *now* of that of Mr. Winans as it might have been spoken of *nearly two years ago*. He passes entirely over its establishment under patent, in use in England, and the account of it not only in an English publication, nearly a year ago, republished at Boston, and repeated in your Journal, in which it is certified by an eminent engineer in that country to have the mechanical advantage of nearly 4 to 1 over the best rail-way wagon before known and used, but also the *obvious practice* on the Baltimore road. The truth is, that the road itself has so absorbed admiration, that probably the Editor, or the writer of that article, may have himself rode on it without knowing that he was also on a friction wheeled wagon.

Now, with all due deference, I cannot see any use in the display of learning on such subjects, when facts so obvious and so pertinent to the very occasion, are not only passed over, *but a groundless prejudice disseminated*, as much at variance with the great interest of internal improvement, as with that of the inventor. For that article, after arguing *pro and con* the question between canals and rail-roads, comes to the conclusion that, "still upon the success of some *friction saving apparatus*, must depend the great question whether rail-roads can compete with canals."

Now, certainly it would have been reasonable, if known, to have adduced in support of this side of the question, *the fact* that such apparatus had actually been put in practice in our own country to an *important extent*, and carried hence acceptably even to England.

Perhaps the committee's report may have had some influence on the writer, and the cautious opinions of scientific and practical men, may have led him to do injustice, not only to the inventor, but to his subject, so immensely interesting to this country. It is not the value of the wagon to the inventor, that is of any comparative moment, but the *value of the machine to the public.* Besides that, if it has such effects in the economy of rail-roads, it must agreeably influence their location, on the very principles explained in the Review, and that will, therefore, greatly extend their benefits, not only where canals cannot be made, but where they already exist, as *tributaries* to their business, branching into districts otherwise incapable of cheap communication with the great navigable line.

The committee, it seems to me, are now invited by a sentiment of patriotism, to look further into the subject referred to their judgment. And I hope they will, in the spring, even make an excursion to Baltimore, and see the wagons of Mr. Winans in operation, and compare their performance with a simple wagon, and then make a supplement to their report, of whatever appears to them to be the practical advantage thus far attained.

Practical Observations on the Pneumatic Process for Expelling Molasses and Sirop from Sugar.

(Concluded from page 409.)

Incidental remarks on the manufacture of Sugar from the Cane Juice into Raw Sugar, and the subsequent products therefrom by refining.

In the manufacture of raw sugar from the cane juice, an expeditious and economical mode of effecting a complete separation of the heterogeneous matter in union with the saccharine, and of producing the greatest weight of crystals of the best quality, is the desideratum of the planter. But does he obtain these advantages by any of the processes now in use in the colonies? Certainly not. Improvements have been introduced in the colonies to a very limited extent, in comparison with those which have, of late years, been adopted in the refining of sugar in Great Britain. It is natural to suppose, that the first and chief aim of science would be to produce a good raw material; that such will eventually be the case, there can be little doubt; as, at this moment, a great excitement is produced in the minds of the planters, by the attempted introduction into the colonies, of various schemes and processes for improving their sugar. This has been particularly the case by Mr. Innes introducing this identical pneumatic process, which aims, not only at the discharge of the *real molasses*, or uncrystallizable matter, but also at the separation of the other impurities still adhering to raw sugar, an operation of refining which, has hitherto been effected by the refiners of sugar in Great Britain.

If this last mentioned separation is deemed of so much importance

in the refining of sugar; and if, as it is admitted, greater and finer products are obtained, when the separation is effected before clarification and evaporation, with the least possible action of heat, surely similar advantages are desirable in the manufacture and crystallization of the cane juice.

Reasoning by analogy, the writer has been induced to believe, that many of the evils complained of by the growers of sugars, especially those of inferior qualities, might be obviated, not merely by an improved method of evaporation and curing, but by arrangements prior thereto. And if the writer's hypothesis upon this point should prove correct, and should be coupled with the recent improvements in evaporation, very superior raw sugars, to those now sent from the colonies, might be made, with less expense and very little increase of attention.

The hypothesis submitted is—

1st. That the sugar cane has its component parts divided, in a greater or less proportion, according to the place or distance from its root or stole.

2nd. That the earthy and denser particles, (and probably the chief portion of the impurities,) blended or united with the saccharine, are nearest to the root; and, in consequence, the saccharine juice is in a purer state progressively, from the root to the top of the cane.

If these positions are correct, would it not be adviseable to cut the lower joints from the cane before it is taken to the mill, to separate the finer portions from the grosser ones, and separately to grind and manufacture their juices? The clarification and evaporation to the consistence required for granulation, would, in the ordinary way of operating, be facilitated, and yield products proportionably better. We know, that the finest fruit is plucked from the extreme bough of a tree; and that that which is nearest to the root is more crude, although equally exposed to the influence of the sun's rays. Separation and selection of qualities is found to be essential in the making of wine, cider, and other vegetable productions; why then may not the same mode of practice apply to the cane juice? If it is found beneficial to separate the part of the cane next to the top, because the matter therein is less ripe than the other parts, surely, by a parallel reasoning, the bottom may contain other matter equally, or perhaps more injurious to the subsequent operations on the juice for the products obtained therefrom.

Under all circumstances, whether the foregoing surmises be correct or not, it must be admitted, that separation of the adventitious substances, intimately mixed and combined with the cane juice, is the first point to be obtained; and secondly, that such separation is best effected with the least possible action of heat, which, in proportion to its intensity and duration, carbonizes and coats the crystals of sugar.

The subsequent separation of this coating from the crystal is, at present, best effected by the pneumatic process; the utility of which in the colonies, for this purpose, would decrease as the improvements in growth, clarification, and evaporation, increased; and, eventually,

the pneumatic process might only be necessary to accelerate and complete the curing or drainage of the real molasses, or uncrystallizable part of the cane juice. Such drainage only, whether effected by this process or by any other, ought to be permitted by the legislature, for reasons before advanced.

In treating upon the refining of raw sugar, it is intended to select those systems which, by practice and analogy, bear upon the subjects under review, instead of attempting to discuss all the varieties existing, and almost daily starting into birth.

Every refiner, either from habit, prejudice, or economy of capital, adopts that system which he thinks best and most suitable to his trade. The opinions and modes of working are almost as numerous as the refineries worked: in some, clarification by blood, with or without a previous separation of the molasses, or colouring matter, is adopted, and evaporation effected by fire pans. Some use charcoal in the clarification, others chemical compounds; some clay the goods, others use magma, or sirop, in lieu thereof; some clarify and evaporate by steam heat, instead of fire, but the most opulent of the refiners have adopted the improvements made by the late honourable Edward Charles Howard, and their products possess a more brilliant appearance, and must rank as superior to those obtained by any of the former methods, with the exception of Mr. Kneller's,* which yields equally brilliant products.

The desiderata of the refiner and planter may be classed as follows:—

1st. The best separation of adventitious substances.

2nd. The separation, clarification, and evaporation, at a degree of heat not affecting the sugar.

3d. The greatest weight of crystals of good colour and brilliant appearance.

4th. The least quantity of molasses or treacle.

5th. The shortest period of manufacturing the products.

6th. The most economical mode of working.

The two first points may be considered as axioms in the art of manufacturing sugar; and, if adhered to, will effectuate the remaining objects; and their practice ought to be adopted, primarily in the colonies, where they would be of greater value than in this country.

Incidental remarks have been made as to the adoption, in the colonies, of a mode of separating impurities combined with cane juice, previously to its being submitted to the action of heat; and the pneumatic process has been descanted upon to prove, that its use would effect the separation of those impurities which still adhere to the sugar after it has been manufactured. The planter is interested in both operations, and especially so in consequence of the immense loss by drainage, and the permission which government, at present grant, to import sugar divested of a part of the impurities and the colouring matter, at the duty payable upon raw sugar, which has not undergone the process of separation; but the refiner's in-

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* See page 163, of our last volume.

terest is more immediately confined to the working of raw sugar. Such as it now is, necessity compels him to make the separation therefrom of the impurities and the colouring matter, and this he best accomplishes by a low degree of heat applied throughout his manipulations.

Experience has demonstrated to the scientific refiner, that the admixture of the colouring matter *adhering* to the crystals of raw sugar, is disadvantageous to the refined products, and must be detached therefrom by the process of claying or siroping. The abstraction of the colouring substance, as a primary procedure, has been effected, both by mechanical and chemical processes, none of which have, as yet, been found equally efficacious with the pneumatic process; but with all its advantages, and like the other methods of pressing, claying, or melting, a portion of the finer part of each crystal is dissolved and mixed with the discharged or expelled colouring matter; and, however judicious the operations may be, to separate the crystallizable parts from this colouring matter, by subsequent and repeated operations, still some portion of the crystals remain in the molasses, or treacle, and are therein deposited by natural causes.

In any way, therefore, abstraction of the impurities and colouring matter, previous to clarification and evaporation, must be a positive benefit; because, by the subsequent application of heat, at the temperature required for those purposes, there is an increased tendency to carbonization in proportion to the increased degree of heat applied, its duration and repetition, which likewise operates in an increasing ratio, according to the decrease in quality of the sugar or sirop submitted to its action. The purity of the medium, or solution of sugar, also contributes materially to the abundance and beauty of the crystals.

These positions are exemplified by refining lumps into double loaves: the lumps are refined sugar, and contain a very inconsiderable portion of colouring matter; but it is necessary to separate that small portion, in order to obtain double loaves. Too much heat is applied to melt, clarify, and evaporate, in this second process; the crystals produced are very fine and white, but the residue is treacle; it must, therefore, be evident, that a high temperature, whenever applied to sugar, produces treacle, which invariably is combined with colouring matter; but still the medium in which the fine crystals are formed, is more pure than a solution of sugar not previously refined; thus heat engenders carbon.

In a previous part of this work, statements have been made as to the relative value of raw, pneumatic, and ordinary lump sugars, when used for refining: the advantages of separating the molasses or colouring substance from raw sugar, previously to refining it into loaves and lumps; and also the disadvantageous action of heat upon saccharine solutions, varying according to the degree of heat applied, its duration and repetition, and the quantity of colouring substance contained in them. It may be asked, can such statements and reasonings be substantiated by practice? Investigation is, there-

fore, necessary to ascertain whether such statements and reasonings are founded upon facts. It will be readily admitted, by those gentlemen who are conversant with the principles of refining, that such is the case; but to those who have not a knowledge of the art, it may be needful to prove more clearly, that the positions advanced are correct, by stating—

1st. That

112 lbs. of raw sugar, as imported, yield, by the old system of refining, by the use of a fire-pan, at a mean proof of 240° of Fahrenheit's thermometer,

28 lbs. of treacle.

2ndly. That

112 lbs. of raw sugar, in the same state, yield, by the improved system, by the use of vacuum-pan, at the proof of 155°, (afterwards raised, in the granulating vessel, to 180°,)

20 lbs. of treacle.

3dly. That

112 lbs. of raw sugar, (first partially cleared of the molasses by being made into meltings, and evaporated in the precise manner last mentioned,) yield

14 lbs. of treacle.

4thly. That

112 lbs. of raw sugar, operated upon or refined by the pneumatic process, to produce white crystals, of the quality of ordinary lumps, and the extracted sirops therefrom, evaporated at 245° of heat, will yield only

12½ lbs. of treacle or sirop.

By these comparisons it appears, that by the first method, about 28 lbs. of treacle are produced, when the molasses and colouring substance in union with the sugar, are operated upon by 240° of heat.

2nd method, when in the same state, and at 180°,

20 lbs. of treacle.

3d method, a partial separation of the molasses, &c. having been effected by meltings, and the same heat of 180° applied,

14 lbs. of treacle.

And, by the fourth method, evaporating the extracted sirop and the colouring matter in a more concentrated state, even at 245° of heat, only

12½ lbs. of treacle or sirop.

Thus showing that the degree of heat, and the repetition thereof, engenders an additional quantity of molasses, &c. to that which the raw sugar contained when imported; and that a lesser quantity is engendered when a separation of the molasses, &c. has been effected previously to the action of heat; it may, therefore, be presumed, that raw sugar contains even less than 12½ lbs. per cwt. of treacle, the *least* quantity obtained, at the highest degree of heat employed for one evaporation.

As such, the planter and refiners could not fail to obtain considerable advantages, if they adopted a better mode of evaporating

the cane juice and solutions of sugar to that which is now generally employed.

Charcoal is injurious, because it destroys or weakens the crystallizing properties of sugar to a certain extent; it must, therefore, like lime, be classed as a disadvantageous agent in refining.

The French refiners use from ten to fifteen pounds of animal charcoal to each 100 pounds of sugar; their products possess colour, but are deficient in strength. Some compensation is obtained, by their evaporating to a lower proof than is usual in this country, in open fire-pans, and upon a less quantity for each skipping.

In conclusion, as to the best method of obtaining and applying heat to all purposes connected with the manufacture or refining of sugar, and with due deference to the opinions of those persons who have had a longer and more extensive experience than the writer, he submits that steam heat is to be preferred, and that simplicity in the combinations of the apparatus for that purpose is most desirable, and particularly so for the colonies.

Of all the varied schemes which have been presented to the refiners as improvements for evaporation, that of the late honourable Edward Charles Howard is the most celebrated: by his domed, or vacuum pan, as it is termed, solutions of sugar are evaporated to a proper consistence or proof, at about eighty degrees of heat below that which can be obtained in the open pans now in general use. In the domed pan a vacuum is not formed, but the evaporation of the aqueous particles is accelerated by condensation, in the absence of the atmosphere. After the discharge of the skipping, it is necessary to raise the temperature for granulation to about 185 degrees, which is effected by steam, under the receiving or granulating vessel.

The whole of Mr. Howard's arrangements are highly scientific; but his evaporating apparatus, although it has been much improved, and is less expensive than formerly, yet wants simplicity to render it generally useful, particularly in the colonies.

Many other plans have been devised as substitutes for this scientific and valuable improvement in evaporation; but none accomplishes the object so completely as that of Mr. William Godfrey Kneller, for which a patent has been recently granted.*

By this method solutions of sugar or sirops can be evaporated to proof in an open pan, by steam or other heat, at temperatures varying from 140 to 170 degrees of Fahrenheit's thermometer, consequently at from sixty to ninety degrees below the proof hitherto obtained in an open pan, and about the degree of heat required for granulation.

The apparatus attached is of trivial value, and the auxiliary employed so highly beneficial to the strength or crystallization of the sugar, that such a combination of advantages seems to be best suited to the purposes intended, but it remains to be proved, whether the refiners of this country, and the planters, will adopt this other pneumatic system.

* See page 163, of our last volume.

On the means of giving a fine edge to Razors, Lancets, and other cutting instruments. *By* THOMAS ANDREW KNIGHT, Esq. F. R. S. President of the Horticultural Society, &c.

In the preparation of steel, and in the art of subsequently forming it into cutting instruments, the British manufacturers are, I believe, unrivalled; and they have probably approximated, if they have not attained, to perfection: but in the art of giving the finest possible edge to their instruments, when formed, I think they have generally still something to learn; for I hear surgeons often complain that they rarely find themselves in possession of a well set instrument; and I have never yet, in any instance, seen a razor come from a cutler so set that I could use it with any degree of comfort; though I have obtained razors from many of the most eminent manufacturers of the metropolis. The machinery which they employ, has long appeared to me to be imperfect, and uncertain in its mode of operating, and in many respects inferior to that which I have been some years in the habit of using, and which I shall proceed to describe.

This consists of a cylindrical bar of cast steel, three inches long without its handle, and about one-third of an inch in diameter. It is rendered as smooth as it can readily be made with sand, or, more properly, glass paper, applied longitudinally, and it is then made perfectly hard. Before it is used, it must be well cleaned, but not brightly polished, and its surface must be smeared over with a mixture of oil, and the charcoal of wheat straw, which necessarily contains much siliceous earth in a very finely divided state. I have sometimes used the charcoal of the leaves of the *elymus arenarius*, and other marsh grasses; and some of these may probably afford a more active and (for some purposes,) a better material; but upon this point I do not feel myself prepared to speak with decision. In setting a razor, it is my practice to bring its edge, (which must not have been previously rounded by the operation of a strop,) into contact with the surface of the bar, at a greater or less, but always at very acute angle, by raising the back of the razor more or less, proportionate to the strength which I want to give to the edge; and I move the razor in a succession of small circles, from heel to point, and back again, without any more pressure than the weight of the blade gives, till my object is attained. If the razors have been properly ground and prepared, a very fine edge will be given in a few seconds; and it may be renewed again, during a very long period, wholly by the same means. I have had the same razor, by way of experiment, in constant use during more than two years and a half, and no visible portion of its metal has, within that period, been worn away, though the edge has remained as fine as I conceive possible; and I have never, at any one time, spent a quarter of a minute in setting it. The excessive smoothness of the edge of razors thus set led me to fear that it would be indolent, comparatively with the serrated edge given by the strop; but this has not in any degree occurred, and, therefore, I conceive it to be of a kind admirably adapt-

ed for surgical purposes, particularly as any requisite degree of strength may be given with great precision. Before using a razor after it has been set, I simply clean it on the palm of my hand, and warm it by dipping it into warm water; but I think the instrument recommended operates best when the temperature of the blade has been previously raised by the aid of warm water.

A steel bar, of the cylindrical form above described, is, I think, much superior to that of a plane surface for giving a fine edge to a razor or penknife; but it is ill calculated to give a fine point to a lancet, and I therefore cause a plane surface to be made, a quarter of an inch wide, on one side of the bar, by cutting away a part of its substance; and I have found this form to be most extensively useful.

The edge of some razors, whether formed of wootz, of mixed metals, or of pure steel, but particularly of mixed metals, has generally appeared to me to be more keen and active when used a few seconds after it had been applied to the bar, than on the following day; and I have often seen the utmost activity restored to the edge of such instruments, so instantaneously, and by so apparently inadequate means, that I have been sometimes led to suspect the operation of the bar to have been something more than that of having worn away a minute portion of the metal; but I am not disposed to offer any conjectures respecting other effects which I may have conceived it to produce.

I have in many instances been able to give a very fine edge to razors in possession of my friends, which I could not set tolerably well by any of the ordinary means; and I have found that those composed of different materials could be set with equal facility, though the sensations they excited, when used, appeared to me to be in many instances dissimilar. The instruments upon which I have chiefly made experiments, have come from the manufactories of Mr. Pepys, Mr. Stoddart, and Mr. Kingsbury. The material which appeared to me to receive that which I shall call the most eager edge, (and it was very durable,) was wootz, from the manufactory of Mr. Pepys; and that which received the smoothest edge, and which I thought best calculated for surgical purposes, was a mixture of rhodium and steel; the powers of the pure steel of Mr. Kingsbury, appeared to be intermediate; and my experience leads me to believe that, under different circumstances, each of these materials might be used with some exclusive advantages.

[*Journal of the Royal Institution of Great Britain.*

The Chemistry of the Arts, being a practical display of the Arts and Manufactures which depend on Chemical Principles, on the basis of Gray's Operative Chemist. *By* Arthur L. Porter, late Professor of Chemistry in the University of Vermont. *Carey & Lea*, 1830.

The work, on the basis of which the above treatise has been written, is already advantageously known; the demand for it, even at

the expensive rate at which it could be imported, was such as to induce the enterprising publishers, from whose press the work issues, to supply it at a price bringing it more within the reach of those for whose benefit it was especially written. The American Editor has had, abroad, opportunities of inspecting, minutely, the various processes which he has described, and we can but regard the portions coming from his pen, as not the least interesting of the work. Mistakes are corrected, full articles on interesting subjects added to the often meagre results, furnished by the state of information at the time when the operative chemist first issued, and the work concludes with a well arranged detailed statement of the processes of bleaching, dying, and calico printing, contained in more than one hundred pages. The plates, of which there are many, are well executed, and the lettering is generally very correct. The expense of the plates has not been suffered to enhance the price of this book beyond what one should willingly pay for a work important as this; the best and most modern which we have upon the chemistry of the arts.

In order that our readers may be able to judge of the character of the work of which we have just spoken, an extract, from one of the articles of the American Editor, is presented: the article from which this is taken, is on the important art of bleaching.

Bleaching.

Bleaching, in its broadest acceptation, is the art of removing the colouring matter, whether naturally or artificially acquired, from all bodies in the mineral, vegetable, or animal kingdoms. Its most important applications, however, are to those fibrous substances, so extensively used in the fabrication of the clothing of civilized men, cotton and linen, and to these I shall devote the principal part of this article. I shall treat first of the substances, or agents employed in art; and, secondly, of the processes and manipulations, in the order in which they occur.

The materials now used in bleaching are only five in number; viz. water, lime, potash, sulphuric acid, and chloride of lime.

The quality of the water is a consideration of the first importance in the location of a bleachery. No refinement of art has enabled bleachers to surmount the obstacles presented by bad water. Waters impregnated with the muriates, carbonates, or sulphates of lime and magnesia, or with the muriatic, carbonic, or sulphuric acids, in excess, familiarly known by the term, *hard waters*, are unfit for the purposes of bleaching. The small quantity of alkali necessary to precipitate the earthy bases and neutralize the acid, does, indeed, present no serious objection to their use in bucking, nor is there any objection to their use as solvents of the chloride of lime and the vitriolic acid; but their bad washing properties forbids the employment in the dash wheel, where the great demand for water lies. These waters are readily known by the property they have of forming curdy or white precipitates, on the addition of a watery, or alcoholic solution of soap, occasioned by the union of the mineral acid

with the alkali of the soap, and the consequent displacement of the oil, which floats upon the surface. The protocarbonate of iron is sometimes found in natural waters, and is very objectionable in bleaching processes. Waters containing this salt exhibit a reddish ochery scum on standing, which is also deposited upon the banks of pools and sluggish streams. The presence of carbonate of iron is detected by the addition of a few drops of a tincture of nut galls, which produces a purple precipitate. The ferro-cayanate, (formerly *prussiate*,) of potash will produce a beautiful blue precipitate, if the water be previously acidulated with a few drops of sulphuric acid. The muriate and sulphate of iron are more rarely found in natural waters, but when they are present, may be detected by the same means. They are alike injurious in bleaching.

Muddy or turbid waters are obviously unfit for the purposes of bleaching, and particularly for the last washings. They may answer for the earlier processes, provided spring or other clear water can be obtained for rinsing. This is the only species of impurity in water which can be remedied by filtration through sand and gravel, which is an indispensable operation on streams whose banks are muddy and liable to frequent and sudden inundations.

The waters of many streams, particularly those which flow through marshy grounds, are tinged of a yellowish or greenish hue, owing to their holding in solution certain vegetable matters. This is one of the most formidable obstacles to a good bleach, and has not yet been surmounted by art.

From the foregoing remarks, it is obvious that the means of judging of the fitness of water for bleaching purposes, are extremely simple, and attainable by every individual, without even the humblest pretensions to science. A water that is limpid and colourless, that does not precipitate an alcoholic or watery solution of soap, (or, in common language, that is *soft* and will *wash well*,) and that is not discoloured by the addition of an infusion of nut gall, or an acidulated solution of ferro-cayanate of potash, or that does not deposit an ochery matter on the banks of water courses,* may be safely relied upon as in every respect well adapted to the processes of bleaching.

Lime suitable for bleaching should be recently and thoroughly burned, and colourless; in other words, lime that is white, and in other respects adapted to masonry, will answer the bleacher's purpose.

Potash, the vegetable alkali, is another important agent in the bleaching art. This article is never found pure in commerce; besides accidental impurities, it is always united, to a greater or less extent, with carbonic acid. Commercial potash is a mixture of pure potash with the subcarbonate of potash, sulphate of potash, silex, minute portions of other earths, and occasionally of undecomposed

* The ochery matter frequently observed to be deposited on the banks of rivers from the oozing of minute springs, should not be mistaken for a deposit from the water of the stream itself, as such deposits are generally too inconsiderable to affect the general purity of the water.

vegetable matters. These foreign matters exist in very variable quantities in the potash of commerce, and it becomes an important object with the bleacher to find a convenient method of determining the exact amount of real alkali in it, and of course the comparative value of the different lots offered in the market, as a guide to aid him both in his purchases and in the subsequent use of it in his processes. The alkalimeter of Dr. Ure, founded on the quantity of sulphuric acid required to neutralize 100 grains of potash, is a convenient instrument for this purpose. One hundred grains of pure potash will require 105 grains of concentrated oil of vitriol for perfect saturation. The method of procedure is this:—provide a glass tube, sealed at one end, 9 or 10 inches long, and three-fourths of an inch in diameter, and graduate it into 100 equal parts. It is convenient to have the graduation commence a little below the extremity of the open end. The exact contents of this measure is not important, provided the graduation is exact. Such graduated tubes can be obtained at any of the glass houses. Into a tube of this description, introduce 105 grains of concentrated sulphuric acid of a specific gravity, 1.850, or 170° on Tweedale's hydrometer, and fill up the remaining graduated spaces with water; decant the mixture into a wider lipped glass vessel, and stir with a glass rod till the union of the acid and water be complete. Now, as the whole 100 measures contain a quantity of oil of vitriol equivalent to 100 grains of pure potash, it is obvious that each measure of the liquor in the tube is adequate to the neutralization of one grain of potash, and the number of measures required for the neutralization of a solution of 100 grains of any commercial sample is an exact measure of the quantity of real potash contained in it, and, *vice versa*, the number of degrees remaining in the tube is the measure of the impurities contained in the sample. The point of neutralization is ascertained as usual in such cases, by cautious additions of the acids, stirring the mixture on every addition, and trials of the changes of colour produced on litmus and turmeric papers by the liquid. It is proper to caution the operator against a frequent source of error, pointed out by Dr. Henry, in his excellent directions for the manipulations in alkalimetry, from the presence of the disengaged carbonic acid, which, by acting on the litmus paper, may lead him to infer an excess of sulphuric acid. This source of error may be avoided by warming the liquor towards the last of the process, by which means the disengaged carbonic acid is expelled.

Of the oil of vitriol of commerce, one of the next most important agents in bleaching, little need be said. It is generally sufficiently pure as it comes from the manufacturer, for every purpose of the bleacher. It should be colourless, and have a specific gravity of 1.850, or 170° T. If it have a specific gravity greater than that, its purity may be suspected. The usual impurities are sulphate of potash and sulphate of lead. The latter may be detected by a precipitation, on the acid being largely diluted. I am not aware that either have any injurious effect in the bleaching process. But the acidemeter is the readiest method of determining the comparative value of commer-

cial samples, and this is no other than the alkalimeter just described, only reversing the method of procedure;—100 grains of pure potash is to be dissolved in 100 measures of water, in the graduated tube, and portions of the solution added cautiously to 105 grains of the oil of vitriol to be operated on, previously diluted with four or five times its weight of water, till the acid is neutralized. The number of parts, on the graduated tube of the alkaline solution, required for this purpose, will determine the per centage of real acid contained in the sample;—if eighty parts of the one hundred degrees are required for this purpose, then is there eighty parts of real acid in every one hundred parts of the sample.

The last article essential in the bleaching process, is the chloride of lime, or bleaching powder. The introduction of this compound constituted an important era in the history of the bleaching art. What was formerly a work of several weeks, is, in modern bleaching, accomplished in as many days, and with a proportional diminution of labour, and great reduction in expense. The tedious exposures to sun and air, to which, in the old method, the goods were necessarily subjected, are entirely superseded by the use of chloride of lime. The manufacture of this article is described under the head of chloride of lime in this work. It is a dry white powder, having a slight smell of chlorine, and a peculiarly strong, acrid taste, not very unlike the muriate of lime. It is partially soluble in water, to which it imparts its smell and bleaching power. The undissolved portion is an hydrate of lime united with a small proportion of the chlorine. The value of chloride of lime depends wholly on the amount of chlorine it contains. We meet with very variable proportions in the commercial specimens. Bleachers generally judge of the strength from the specific gravity which it imparts to the watery solution. If the powder be dry and have the odour and taste of a good article, the specific gravity is not an indifferent measure, though I have not found it uniformly correct. 5 lbs. of the best bleaching powder should impart to its solution in an ale gallon of water, a specific gravity of 1.025, or 5° T. But a more correct test of the value of this article is to be found in its power of discharging the colour from a diluted solution of indigo in sulphuric acid; for directions for using this test the reader is referred to the article, which treats of the manufacture of bleaching powder in this work. It ought to be known to the bleacher that chloride of lime loses strength by exposure to the air, and to a certain extent even when it is kept in close casks; by free exposure to the air the chlorine escapes, or rather is expelled from the lime by the joint operation of the carbonic acid and moisture of the atmosphere, and a carbonate instead of a chloride of lime remains; no more than one cask, therefore, should be allowed to be open at any one time, and that should be kept as much excluded from air and moisture as possible.

I will now proceed to describe the various processes of the art in the order in which they occur in the bleaching of cotton shirtings and sheetings.

The Steep.

The goods as they come from the loom are impregnated with flour, paste, or starch, used in the process of manufacture. To free them from this foreign matter, they are thrown in loose bundles, each piece by itself, into any large vessel, or cistern, capable of containing the quantity to be operated on, which I will suppose throughout this treatise to be one ton nett, or 2000 lbs. The form of this vessel is a matter of no importance whatever; a common wooden cistern, such as is used for the scouring and bleaching liquors, will answer every purpose, provided there is a means of warming the water in winter by steam; but if this cannot be conveniently done, a spare bucking keir may be made use of when artificial heat is required. On the introduction of every layer of cloths, sufficient water should be admitted into the steeping vessel to wet them, and, in order to secure this object effectually, while one man is employed in putting the goods into the cistern, another should tramp them into the water. It is better that no more water should be used than is sufficient to cover the goods when pressed down. In this state the cloths should remain till a gentle fermentation is produced, which may be known by the appearance of a frothy scum upon the water, and a sour smell from the cistern. In fact the acetous fermentation of the paste, and perhaps some vegetable principle of the cotton along with it, has taken place; its elements have assumed new combinations, and become more soluble in water. It is probable also that the acetous acid which is formed, may, at this early stage, exert a highly beneficial solvent power on the natural colouring matter of the cotton. The time requisite for the steep depends much on the season of the year, or rather on the temperature to which the goods are exposed; during the summer months, twenty-four hours, and sometimes less, will be found sufficient for this purpose; in spring and autumn, from one to two days are necessary; and in winter, artificial heat is indispensable to despatch in business; the acetous fermentation is very sluggish below 50° Ft.: it takes place readily at 60°, but does not attain its greatest activity below 80°, or perhaps 90°. When artificial heat is used, care should be taken not to allow a temperature approaching to a scald, which is supposed to produce a change on the starch or paste, unfavourable to the necessary fermentation when the proper temperature is afterwards acquired. It is scarcely necessary to remark, that the steeping process, if carried too far, would endanger the strength of the fabric. Some bleachers employ for the steep the spent alkaline leys, instead of clean water; a practice highly objectionable; 1st, because it retards the fermentation; 2nd, because this alkaline liquor is already loaded, perhaps saturated with the colouring matter of the cloth, and would be more likely to deposit than to take up an additional quantity at the low temperature of the steeping liquor; and, thirdly, because the acetous acid of the fermentation must, by combining with the alkali of the ley, have the direct effect of precipitating the colouring matter, with which it was previously united, directly upon the cloth. It is a singular circumstance that a practice so fraught with objections, and so opposed to the ac-

knowledged theory of bleaching, should have been either passed over in silence, or noticed with commendation, by all the respectable writers who have treated of the subject. The fermentation of the *steep* might be greatly expedited by the use of a very small quantity of yeast made from damaged flour, which might be deposited near the centre of the lot; but in this, as in the introduction of the slightest innovation upon established practices, the enlightened bleachers may calculate on encountering the prejudices of old workmen in the art. After the steep, the goods are to be opened out of the band, or bundle, in which they are usually made up, and well washed in the dash wheel. Some bleachers improperly omit this washing.

[TO BE CONTINUED.]

On the Setting of Plaster of Paris. By M. GAY-LUSSAC.

EVERY body knows the property of plaster, deprived of water by heat—of forming a hard body with that liquid. The consistence which it acquires is very variable, and those are decidedly the purest plasters which set with the least water. The cause has been attributed, for that of Paris, to the presence of a few parts per cent. of carbonate of lime, but doubtless very erroneously; for the heat necessary to bake plaster, which, on a small scale, does not rise to 150°, (= 302° Faht.) is not raised, in the large way, to the degree necessary for decomposing carbonate of lime; besides, baked plaster does not usually contain free lime, and the addition of that base to plasters of little consistence does not perceptibly improve them. I think that the difference of the various degrees of consistency acquired by baked plasters with water, must be sought in the hardness which they offer in the raw state; a hardness we cannot explain, and which must be taken as a fact. This laid down, I conceive that a hard plaster stone,* having lost its water, will acquire again more consistence in returning to its first state, than a plaster stone naturally soft; it is, in a manner, the primitive molecular arrangement which is reproduced. Thus, we see, good cast steel, from which its carbon has been taken by cementing it with oxide of iron, give, afterwards, by a new cementation with carbon, a steel much more homogeneous and more perfect than that which would be obtained, in the same circumstances, by the cementation of iron.

[*Ann. de Chimie.*

Dying of Silk a Permanent Chrome Yellow. By M. OZANAM.

CLEANSE the silk at one heating of two hours, wash and wring it; plunge the skeins in a solution of sub-acetate of lead more or less

* What is commonly called plaster stone, (pierre a platre,) consists of impure masses of sulphate of lime. It is usually mixed with clay, sand, carbonate of lime, and contains animal and vegetable remains. The sulphate of lime contains twenty-one per cent. of water of crystallization. It is softer than marble in general.—See Thenard's Chemistry, II.—TRANS.

strong, according to the desired depth of yellow. At the end of two hours take them out, expose them to the air for half an hour, then wash them in a stream and wring them.

Prepare a bath, in which a sufficient quantity of neutral chromate of potash, (about from the fifteenth to the twenty-eighth part of the weight of the silk,) is dissolved. Neutralize the bath with half a glassful of hydrochloric, (muriatic,) acid. Leave your silks in it, during half an hour, at the mean temperature: twist or wring them over the liquor, and wash them in a slight solution of soap, just warm, then in a stream of cold water.

The shades of yellow are varied by altering the quantities of the mordant of sub-acetate of lead, and of the chromate of potash, which must always be deneutralized by hydrochloric acid.

[*Recueil Industriel.*

Maryland Institute.

We learn with great pleasure that our sister institution, the Maryland Institute, is in a prosperous condition, and pursuing with activity a course of great usefulness.

This society was founded in November, 1825. Its objects are the encouragement and promotion of manufactures, and the mechanic and useful arts, by the establishment of popular lectures upon the sciences connected with them; by the formation of a library and cabinet of models and minerals,—by awarding premiums for excellence in those branches of national industry deemed worthy of encouragement—by examining new inventions submitted for that purpose—and by such other means as experience might suggest.

In January, 1826, a bill incorporating the Institute, passed both branches of the legislature of Maryland. In the course of the same year, several lectures were delivered by gentlemen, who volunteered their services for this purpose; an exhibition of the products of our mechanical industry was also announced.

The encouragement which was given to the new institution in its incipient state, justified the exertions that were made by the Board of Managers to place it immediately on such a footing of usefulness, as alone could impart to it stability and permanency. To produce this effect, no expenditure of time or money, consistent with the hopes which were justly created by the general interest manifested in behalf of the institute, was spared.

The Managers adopted measures to procure, as early as possible, an extensive apparatus, by means of which the lecturer could make all the necessary illustrations of the fundamental principles of mechanical and chemical philosophy. This having been obtained, the lectures, which had been partially suspended for want of the necessary apparatus, were resumed early last winter, and judging from the manner in which they were attended, appear to have given satisfaction.

Through the exertions of our worthy and efficient delegates, an

annual appropriation of three hundred dollars was made by the legislature. The lecture room has been so fitted up, as to afford comfort to the auditors, and enable the lecturer to carry on his demonstrations to the advantage of the respective classes.*

Mr. Julius T. Ducatel has been appointed to lecture on natural philosophy and chemistry.

The number of subscribers to the society has increased, and the Managers and officers have, we learn, resolved to spare no exertions to secure to the public all the benefits originally contemplated on the foundation of the institution.

The following report will show the prosperous condition in which the Institute commences the operations of its sixth year of existence, and we wish every success to its laudable exertions.

Report of the Managers of the Maryland Institute.

The Board of Managers of the Maryland Institute for the promotion of the mechanic arts, deem it proper, at the commencement of another season of lectures, thus publicly to address the members, and the public generally, on the subject of the Institute committed to their charge. With varying success, this has continued from year to year, until it has become finally, and it is hoped permanently, established. Its object is by this time, too well known to need detailed explanation; it is sufficient to say, that, as its title purports, it aims, and has constantly done so, at the improvement of the mechanic and manufacturing arts, by placing the aids of the science connected with them, in the easy reach of their practisers and professors. Nor, is it believed, has it been altogether without useful attendant results.

The Maryland Institute, however, like many public establishments, lives on the health of public favour, with a better chance of continued existence perhaps, from the fact, that it does not call upon the *charities* of the community, but urges it on the score of its *interests*. To the members and to the public, the Board of Managers, therefore, now address themselves.

During the last winter, the chairs of chemistry and natural philosophy applied to the arts, were respectively filled, and full courses of lectures were delivered on these branches of science. The lecturers were the better enabled to effect this from the excellent accommodations in the Athæneum, and from the apparatus received from France, of a superior kind, and forming the chief part of an order, which, when it is all received, will make the apparatus of the Institute as full and complete as could be desired. The classes which attended the lectures were numerous, attentive, and composed of those who came to learn, and whose learning, when obtained, would be made of use and value, by their industry and intelligence. The drawing school under the direction of Mr. Smith, one of the ablest teachers in the country, and the secretary of the Board of

* Chronicle of the Times. Edited by J. T. Ducatel and G. H. Calvert.

Managers, was opened during the winter, under the auspices of the Institute.

Owing to the exertions of the delegation from this city in the legislature, this body appropriated the sum of three hundred dollars annually to the use of the Institute, so long as it shall be in efficient operation. This sum, though small, is satisfactory, both in the pecuniary assistance which it affords, and the interest which it evinces on the part of the state, in the success of the institution. Depending too for continuance upon the permanent efficiency of the Institute, it will act as a spur to the friends of the latter, to prevent the aid thus given, from being forfeited by neglect or inattention.

The Board of Managers, in making their arrangements for the ensuing season of lectures, deemed it expedient to unite the two chairs of chemistry and natural philosophy in one person, and appointed Professor Ducatel, of the University of Maryland, to take charge of them. With the talents and acquirements of this gentleman, the Board have every reason to be satisfied, and in their opinion on this subject, they are fully supported by the numerous audience which attended his lectures during the last winter. He will now lecture four times a week, twice on chemistry, and twice on natural philosophy. The Board have reason to believe that the remaining evenings of each week will be filled by occasional lectures from gentlemen of acknowledged ability, upon interesting subjects, so that the lecture room of the Institute, during the four winter months, will present a place of resort of the most agreeable and instructive character, where information and amusement may be readily and cheaply obtained. Mr. Smith will again open the drawing school, and when his own abilities, and the excellent collection of models of the Institute are considered, it is hoped that his class will be as numerous as the importance of the subject of his instruction ought to lead us to anticipate.

The contribution to entitle a person to the privilege of membership, is still three dollars, for which all the advantages of the Institute, except the drawing school, are obtained.

Connected with the Institute, is the Apprentices' Library, containing a numerous collection of works peculiarly adapted for the members of this Institution, and which the Board have now made arrangements to put in active circulation.

The Board of Managers confidently hope, that the Institution which has thus far existed, and added its portion of useful duty to the public, will still receive a general, liberal, and willing support.

J. I. Cohen, Jr. *Chairman.*

On the Making of Charcoal.

The subjoined notice has been going the rounds of the European and American Journals, without a single remark in either of them, respecting the author of the improvement to which it refers.

"*Manufacture of Charcoal.*—A new process, recommended in the

Journal des Forêts for this purpose, is to fill all the interstices in the heap of wood to be charred, with powdered charcoal. The product obtained is equal in every respect to cylinder charcoal; and independent of its quality, the quantity obtained is very much greater than that obtained in the ordinary method. The charcoal used to fill the interstices, is that left on the earth after a previous burning. The effect is produced by preventing much of the access of air which occurs in the ordinary method. The volume of charcoal is increased a tenth, and its weight a fifth."

The discoverer of the foregoing method of making charcoal, was Mr. Marcus Bull, of Philadelphia. The process was published in the Franklin Journal, for June, 1826, vol. i. first series, p. 358. By the following extract it will be seen that the foregoing account, from the *Journal des Forêts*, is given nearly in the words of the original publication.

"In the paper of Mr. Bull on the subject of fuel, that gentleman has described his method of obtaining charcoal, by surrounding the pieces of wood to be charred, with pulverized coal, by which a product is afforded equal in every respect to that made in cylinders, or retorts of iron. The Editor has seen some of the charcoal made upon this plan, in the large way; its superiority to that produced by the common process was very striking. The plan proposed can be pursued with facility and without expense, and the great saving of wood from the increased quantity obtained, is a circumstance which renders it of national importance."

Mr. Bull says, "it occurred to me that an important improvement might be made in the common process of making charcoal, by filling the interstices between the sticks of wood, with the culm, or fine coal, left on the ground after the large coal has been drawn from the pit; and by covering the wood more perfectly than is usually done. In this way we may more completely prevent the access of air, which is not only destructive, in many cases, to a large portion of the coal, but also renders what remains less valuable."

"An intelligent collier in New Jersey applied, in a partial manner, the plan proposed. He found the product to be about 10 per cent. more in quantity, *by measure*, than he had ever before obtained from the same kind and quantity of wood; and I also found the coal when brought to market, nearly 20 per cent. heavier than usual."

[Editor.

Shell Lac and Seed Lac. Reply to Query.

By turning to page 102 of the Franklin Journal, vol. ii. first series, the subject of seed lac and shell lac, as applied to varnishes, will be found to be treated at some length. The manufacturing of sealing wax. The application of shell lac to the stiffening of hats, and various modes of bleaching this resin, have also been fully made known in this work. We wish that "Many Manufacturers" would purchase the volumes, and examine for themselves.